THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIII. No. 1343.] LONDON, FEBRUARY 5, 1889. [41ST YEAR. Price 6d.

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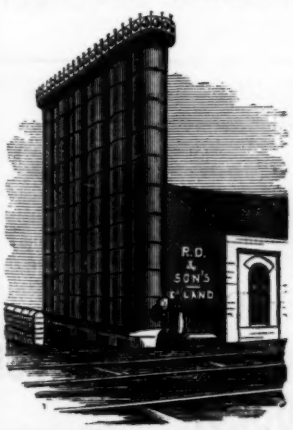

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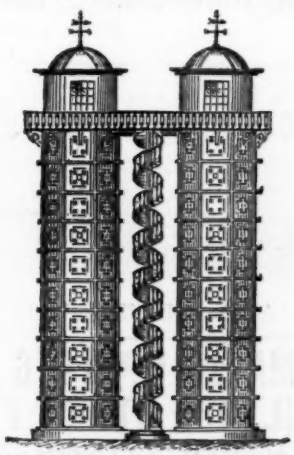

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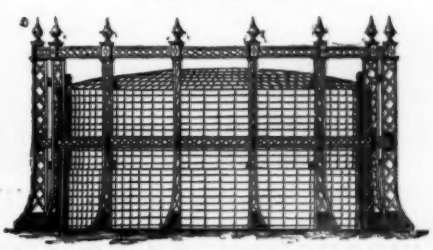

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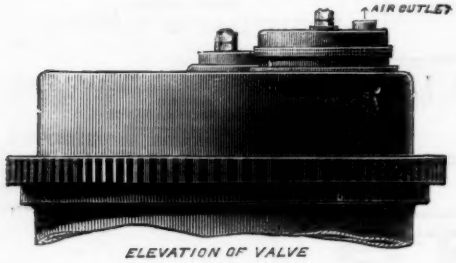
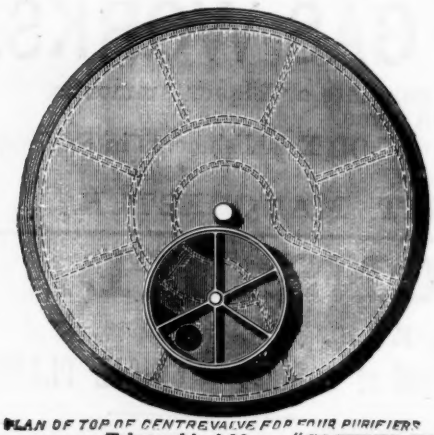


ELEVATION OF VALVE



PLAN OF TOP OF CENTRE VALVE FOR FOUR PURIFIERS

Wood Grates for Purifiers. / Wood Boards for Scrubbers. / Cast-Iron Main Pipes and Connections. / Station Meters. / Governors. / Valves of every description. / Brass Fittings. / Lamp Columns. / Boilers. / Weighbridges. / Coke Breakers. / &c., &c.

Patent Washers with improved Overflow Arrangements, requiring no Motive Power, and giving unexcelled results.

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The illustration shows one of our new Patent Air-Clearing Valves as fixed on the Cover of a Centre-Valve. When in action, the clean gas from the Outlet Chamber of the Valve is passed down the Outlet-Box of the Purifier last changed, and forced through the Inlet into the Air-Clearing Valve, from which a proper outlet is provided on the top, leaving the Purifier ready charged with clean gas in place of air, as is usual; thus preventing the spoiling or wasting of a large quantity of gas.

Many of these Valves have been fixed, and are giving every satisfaction.

TESTIMONIALS ON APPLICATION.

Drawings, Specifications, and Estimates for Apparatus (and the necessary Buildings and Tanks if desired) furnished on application.

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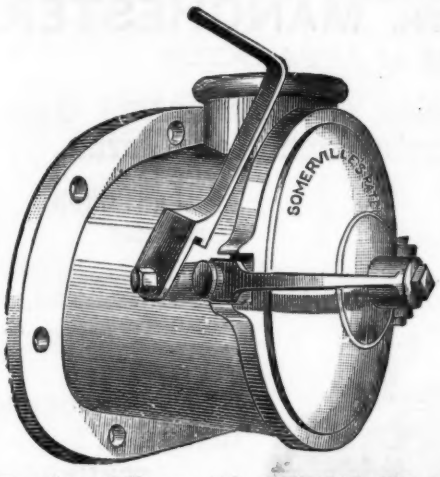

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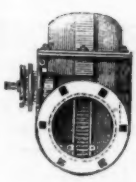

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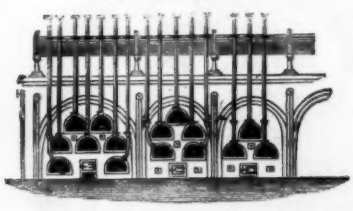

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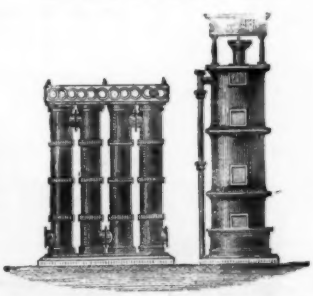

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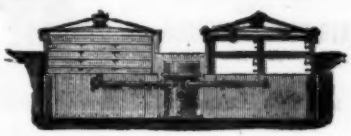

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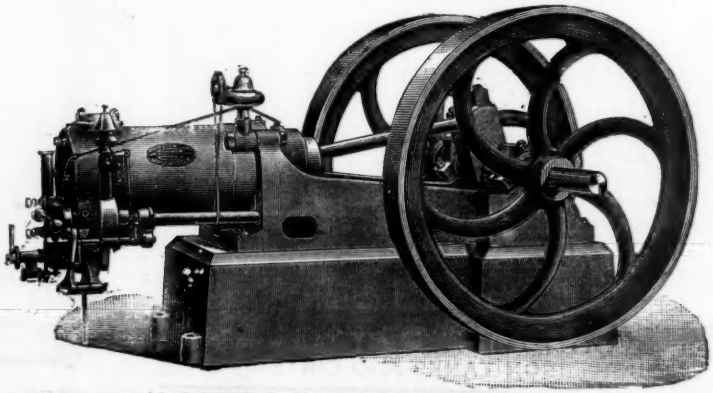

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VERTICAL
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FOR

GAS PURIFICATION

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EXTRACTION OF AMMONIA FROM GASES

FROM COKE-OVENS AND BLAST-FURNACES.

AT THE PRESENT DATE

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EQUAL TO A

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HAVE BEEN ORDERED, AND THOSE IN OPERATION

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GIVING UNIVERSAL SATISFACTION.

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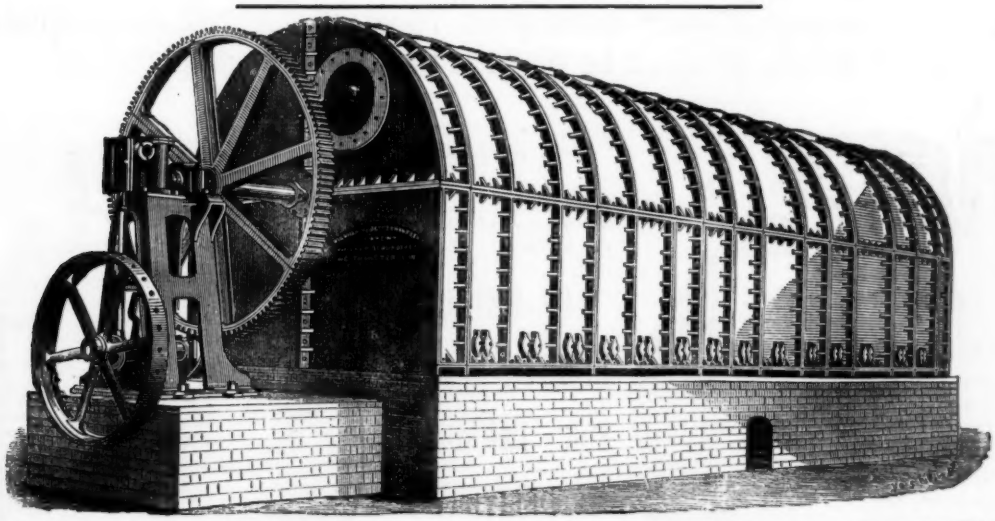
(Signed) G. C. TREWBY.

Testimonials as to Efficiency are too numerous for publication, but can be had on application at the Company's Offices.



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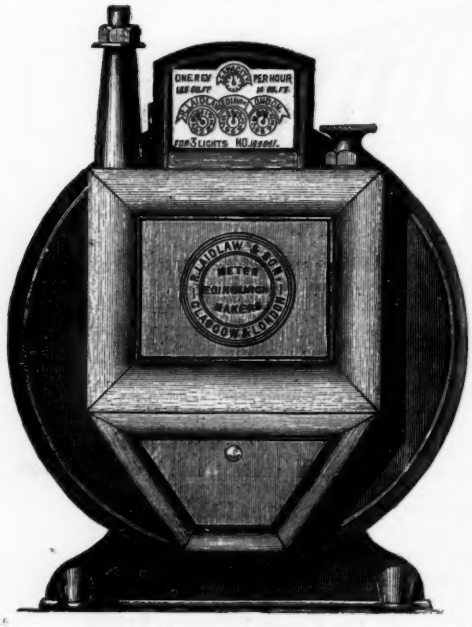

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"*Since the appearance of our* ['*The Engineer*'] *notice, the Hammer has been in some respects re-modelled, and its remarkable economy placed altogether beyond a doubt. . . . The Hammer described is that known as the ¾ cwt. size, and has a cylinder of 7 in. diameter and 6½ in. stroke. The maximum blow is very nearly that which would be given by* **a weight of 3 cwt. falling through a height of 1 ft.**; *and this can be repeated at the rate of* **110** *blows per minute. . . . Extended test in practical smith work has demonstrated that over* **2500 of the heavier blows** *referred to above, can be given with* **one pennyworth of gas** *at half-a-crown per 1000 feet—i.e., the Birmingham price to small consumers—or over 4500 varying blows for the same consumption.*"—"**The Engineer,**" **Sept. 10, 1886.**

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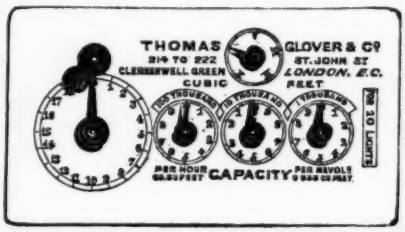
By setting the Hand of the large Circle on the left-hand side of the Dial, Gas Companies can allow a Consumer to receive only



the exact amount of Gas they have received prepayment for, and thus avoid the unpleasantness of asking users for a deposit.

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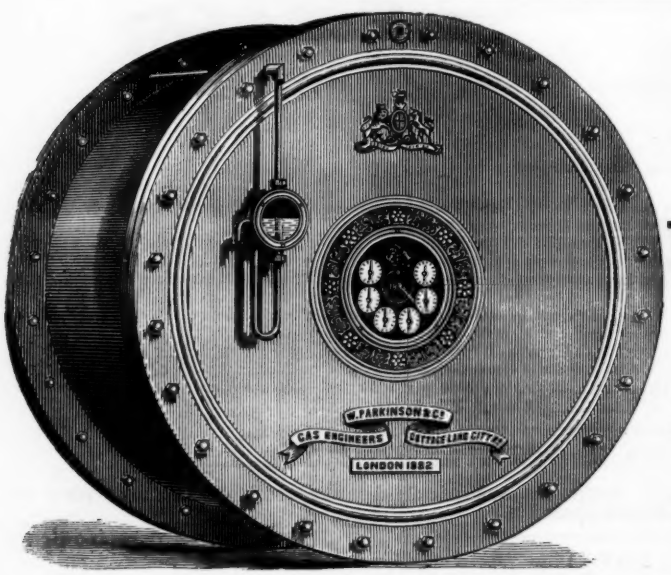

STATION METERS

IN

ROUND or SQUARE TANKS,

FITTED WITH PATENT

THREE-PARTITION DRUMS

MORE THAN

250 STATION METERS,

Varying in size from 1200 to 200,000 cubic feet per hour, have been sold, fitted with

THREE-PARTITION DRUMS,

Since their introduction three years since.

ROUND METERS as above are kept in Stock in all Sizes, ready to send away at the shortest notice. Compact, portable, and very easily fixed. An Improved Overflow Water-line Regulator fitted to every Meter.

PRICES VERY MODERATE.

DURABILITY UNEQUALLED. SOME HAVE BEEN IN CONSTANT USE FOR OVER 60 YEARS.

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TITLE-PAGE AND INDEX TO VOL. LII.

Several inquiries having been made regarding the above, we call our readers' attention to the paragraph which appeared in our last issue (p. 195), and remind them that a Title-page and Index to Vol. LII. of the JOURNAL—July to December, 1888—have been prepared, and will be forwarded by the Publisher free of charge on receipt of a post-card. Cases for binding Volumes of the JOURNAL may be obtained, price 2s. each.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 5, 1889.

THE REPORT AND ACCOUNTS OF THE GASLIGHT AND COKE COMPANY.

LAST week we published the report of the Directors of The Gaslight and Coke Company for the half year just closed; but the matter reached us too late to be noticed editorially. The report and accounts have been issued this time with greater despatch than ever; and the ordinary meeting is called for Friday, when the proprietors will have every reason to congratulate themselves and the Directors on the position and prospects of their great undertaking. The report begins by stating that the accounts for the past half year show a balance of net profit, after making provision for all charges, including interest and preferential dividends, of £660,161, out of which the Directors recommend the payment of a dividend after the rate of 13 per cent. on the ordinary stock. This will absorb the sum of £355,459; leaving £304,702 to be carried forward. Considering that the price of gas was reduced by 3d. per 1000 cubic feet with the beginning of the past year, this is a remarkable result. The Directors ascribe it to the increase of gas consumption, which was 3 per cent. for the year, and to improvements in the trade in residuals. For the same reasons, and having regard to "the almost "certain lapse of the payment for coal dues," the Directors made their current reduction of another 3d. per 1000 cubic feet. That after a long period during which their price for gas seemed to be immutably fixed, the Directors of this Company should have been able to come down from 3s. to 2s. 6d. per 1000 cubic feet in two successive years is a very striking reflection indeed. It is something upon which the proprietors and consumers together must be felicitated. Nobody can doubt that the position of the Company is stronger, in face of its competitors for business, with the price of gas at 2s. 6d. than when it was 3s. The public have been taught once more that the cost of gas is diminished whenever this is rendered possible by the course of trade; and investors can judge for themselves, from the same evidence, how little the business of gas supply is affected by all the loudly-heralded progress of electric lighting. There is probably more electric lighting scattered throughout the district of The Gaslight and Coke Company than anywhere else in England. All the principal theatres, railway stations, public halls, commercial establishments, and palatial town residences in which the electric light is most favoured, and where its cost is least objected to, lie in the area served by this particular Gas Company; and what harm has it done to them? This is a topic that Colonel Makins, M.P., the Governor of the Company, may be expected to touch upon in his speech on Friday; and he should be able to bring forward some interesting data to illustrate the way in which electric lighting fosters, rather than checks, the demand for gas. It is with particular satisfaction that we note the allusion in the report to the bearing of the expected removal of the coal dues upon the last reduction of the price of gas. For once, and it may be supposed independently, the two great Metropolitan Gas Companies speak with accord upon this point; from which we augur that Colonel Makins has seen the error of his past declarations—some of which were quoted to prove that the removal of the dues would have no effect upon the price of gas in London—and is now prepared to take his place unreservedly with those who have always protested against the imposition. There is not much else in the report to call for notice. The Directors believe that there is a considerable increase in the sale of gas used for cooking, heating, and motive power, and express confidence respecting the future prosperity of the Company. The report concludes with a brief reference to the litigation with the South Metropolitan Company, which now awaits the final hearing in the House of Lords; and it may be opined pretty confidently that both parties wish it well over. From Mr. G. C. Trewby's report upon the Carbonizing and Construction Department in his charge, it appears that at last all the Beckton retort-houses have been fitted up for use. The fact that this has only now become necessary, shows how far in advance of actual requirements the Beckton works were built. The Company's new 4 million cubic feet gasholder at Bethnal Green, which is to be ready for next season, is only a moderate addition to their storeage capacity, as holders go now-a-days.

Turning to the accounts, we find the Company's revenue from the sale of gas for the half year amounted to £1,178,303, as against £1,233,450 for the corresponding period of 1887, when the price of gas was 3d. per 1000 cubic feet higher. If we accept the Directors' estimate of the value of this reduction, it follows that, if it had not been made, the rental would have been £100,000 more. The actual loss of revenue is only £55,147, however; so that it can be said that increased business made up nearly half the deficiency. Meter and stove rental exhibit a steady increase, which means new customers. Residuals show where much of the Company's recent prosperity comes from. They returned £361,404, as compared with £297,504, or a rise of £63,900 for the half year, which is very good. Coke brought in £29,257 more; and tar shows a rise of £31,093. Ammonia is only £4484 better; the improvement in the value of this residual not having kept pace with the increase in the value of tar. It would be interesting to know how these alterations in the market are brought about; but this is apparently an inscrutable mystery. They are something to be thankful for, but not to explain. Altogether the

income of the Company for the half year attained the respectable figure of £1,571,858, as compared with £1,562,442 for the corresponding half of 1887, or a positive gain of £9416, which demonstrates that the reduction of price was not made too soon. On the other side of the account, it appears that gas manufacture cost £821,654, as compared with £777,658; the increase occurring in every item except in purification. Coals cost £21,249 more; wages are £5256 higher; and repairs are £18,637 more. Distribution cost less; but there is an increase under the heading of rates and taxes from £71,741 to £76,076. Law charges have dropped from £3422 to £478, consequent, it may be supposed, upon the cessation of the steam-roller litigation between the Company and the Vestries. Bad debts are less; and annuities show a considerable reduction from £13,143 to £8645. The total expenditure is £1,027,897, as compared with £991,682; and the balance carried to net revenue account is £543,961. compared with £570,760 at the same period last year,

The capital account this time makes a little different appearance from the statement of a year ago, when £13,000 sufficed to keep this great undertaking in new works, buildings, and plant. For the last half year the sum of £76,329 was laid out in this way, including additional land; and the only credit items are depreciation of meters and stoves. The capital expended by the Company to the end of the year has, therefore, been increased to £10,310,230. No fresh capital was received during the half year. This time last year a dividend at the rate of 12½ per cent. was paid, which absorbed £334,936; now the increased dividend of 13 per cent. will take £355,459. The statement of coals used shows that the total weight of coal carbonized for the half year was 880,587 tons, of which 15,965 tons were cannel. Last year the figures were: Total coals 849,609 tons, with 11,082 tons of cannel. This increase in the consumption of cannel is a step in the wrong direction; but it is difficult to say very much about the matter in view of the trouble all the Metropolitan Companies have had with the gas testers. There can be no question on the part of anyone who knows the facts that the gas-testing arrangements of the Metropolis are a complete farce, which does not prevent them from being a great and constant worry to the gas makers, and from causing occasional waste of cannel. The increase in the bulk of gas sold is 333,920,000 cubic feet for the half year—a very substantial expansion. The number of public lamps served by the Company has grown from 47,800 to 48,442. There is nothing else of special note in these accounts, which are decidedly of a nature to satisfy the proprietors. With an extra three-quarters per cent. of dividend, with the prospect of increased trade in the future, and every division of the accounts devoted to the statement of profits and savings showing a big balance in hand, the Chartered shareholders will have every reason to be jubilant when they meet next Friday. The Governor will be jocund; and his supporters pictures of content. It is to be hoped that in their prosperity, the magnates of Horseferry Road will not forget the claims of the working bees who collect the honey for them; but that the declaration of a 13 per cent. dividend will be made memorable also to the excellent staff, without whom not the best Directors in the world would be able to work the concern at a profit. When the proprietors and the public are sharing in the good results of profitable trading, surely the officers and servants will not be overlooked!

MR. ALFRED COLSON'S CIRCULAR.

THE progress of the movement for the establishment of a new National and Representative Organization for the Gas Industry of the United Kingdom is dealt with in detail in another part of the present issue of the JOURNAL, in connection with the issue last week of the circular inviting gas engineers and managers to join a Provisional Committee with this object. We do not propose to take this matter out of the place and order in which we have treated it since the beginning of the year; but the extreme gravity of the present crisis impels us to use every method of directing our readers' attention to the fact that the time has come for individual action. We have plainly declared our opinion that the present controllers of The Gas Institute have gone hopelessly astray, and that the only hope for the creation of a really representative organization is to be found in the movement with which Mr. Alfred Colson is now identified. A large number of gas engineers, managers, and secretaries of Gas Companies and Gas Committees of Corporations have received during the last two or three days a form of invitation to join in this movement; and as in a proceeding of this kind it is always possible for eligible names to be omitted, and the post is not infallible, any gentlemen who have a claim to a voice in this matter, and have not received a circular, are asked to communicate with Mr. Colson. What we are specially concerned to point out in connection with this movement is that in its present stage there is no programme, and that the only test of opinion proposed to those who are qualified to take part in it, is the very wide resolution which states that a national and representative organization is desirable for the advancement of the gas industry. Beyond this, there is nothing propounded. It is impossible to lay too much stress upon this fact, and on the consequence that the new organization will be what the Provisional Committee now being formed choose to make it. If anyone thinks that he is only invited to accept a cut-and-dried policy as regards membership, procedure, or anything else, he is totally mistaken. All are required to help. The new institution will start with a clean slate, which the Provisional Committee will fill up. All the power of direction will be in their hands; and anyone qualified to offer a suggestion for the new organization from this vantage-ground who fails to do so, will only have himself to thank for being left out in the cold. Engineers should not need reminding that the only proper time for making a ground plan of a proposed structure is before anything has been done upon the cleared site. It is idle to think of tinkering it afterwards. It is for those for whom the new edifice is to be built to say in the beginning how they will like it arranged; and this is the duty that will have to be discharged by the Provisional Committee now being constituted.

THE APOLOGY OF THE METROPOLITAN BOARD OF WORKS.

THE Metropolitan Board of Works, before giving up their place to the London County Council, have taken care to issue, in the form of their annual report, a concise statement of what they have done for London during their thirty-three years of active existence. This statement is divided under several heads, with only a few of which we are concerned. Respecting the Coal and Wine Dues, the report begins by remarking that this kind of taxation has existed in some form or other from very remote times—a statement which we have heard before, and which might be made use of to defend the existence of many ancient abuses. An account is given of the special objects for which the revenue derived from the dues has been expended; and it is once more declared that, in the opinion of the Board, this source of income is very desirable. Upon the subject of gas supply, the report has a good deal to say. When the Board came into existence, there were more than twenty different Companies supplying gas within the area under the Board's jurisdiction. Their districts were not defined; and competition was rife. The result of this state of things was that gas was bad and dear; and there was no public control over it. The Metropolitan Board were at first compelled to look upon the doings of the Gas Companies in impotence; not having parliamentary authority to interfere. The districting in 1860 was carried through without the Board; and they consequently fail to allow that the public derived much benefit from this reform, though it is admitted that the Companies had reason to be satisfied with the change in their circumstances. The narrative then goes on to 1866, when the Corporation of London promoted a Bill to enable them to construct gas-works, which, with another Bill for transferring the property of the Gas Companies to the Metropolitan Board, was rejected by Parliament. It is also told how the Board advised the Government of that day that the Companies should either be compelled to sell 18-candle gas at the maximum price of 3s. 6d. per 1000 cubic feet, or that, in the alternative of purchase by the Board, the gas shareholders then entitled to, and in receipt of 10 per cent. dividends, should be compelled to take instead 6 per cent. interest on their invested capital. The Government did not adopt this audacious proposal; but brought in a Bill for the regulation of the gas supply of the Metropolis, which did not pass. The agitation was kept up through 1867 and 1868; the outcome being the City of London Gas Act. There is a characteristic grumble that in this legislation the Companies had the best of the bargain. The incidents of the coal famine, and the action of The Gaslight and Coke and Imperial Companies in proceeding for a revision of selling price, are recounted. These events led to further legislative action; and the report goes on to show how the Board in 1875 proposed the one-sided sliding scale. The whole question was gone into before Mr. W. E. Forster's Committee; and the report states that the Commercial Company subsequently adopted the provisions of the

Bill promoted by the Board and the City Corporation for regulating the conditions of the supply, and that the Engineer of the South Metropolitan Company "gave evidence in favour of the "main provision, that relating to the sliding scale of price and "dividend." Ultimately the sliding scale working both ways was agreed to; and the auction clauses were also accepted by the Companies. The Board take great credit to themselves for the policy enunciated in 1875, and adopted by Parliament in 1876, characteristically sinking the difference between the one-sided sliding scale they supported and the fairer principle which superseded it. The Board always were parochial; and parochial they remain to the last. They cannot refrain from suggesting that it may be found desirable to revise the present initial prices of the Companies, not because the price of gas has been reduced to the consumer, but because the shareholders' dividends have been increased; and they cannot rise to the conception that the two results are rigidly connected. Finally, with a sigh of regret that the Board have had no power to fine the Companies for small deficiencies of illuminating power claimed to be ferreted out in remote holes and corners by the aid of the portable photometer, the report closes its reference to gas supply. It is sufficient to say that from its ignoring of the good work done by the Companies, and its attempts to decry their motives and performances, this report is worthy of the Board which is about to perish without a token of regard from any section of that population whose interests it has professed to seek even at the sacrifice of fairness.

MR. R. DEMPSTER ON AMERICAN GAS-WORKS.

In another column will be found the commencement of an interesting account, supplied on our invitation, by Mr. R. Dempster, of Manchester, on the condition of gas lighting as it appeared to him during a recent tour through the United States. His impressions of American gas engineering are very much what would be expected by any English gas manager who might be in the way of seeing the American journals devoted to the industry, especially in connection with the particular difficulties attending the supply of gas by Companies always constrained to work under speculative conditions. The unrestrained liberty possessed by American Local Authorities of granting franchises for the use of the subsoil of their streets to speculators in gas supply, has been the cause of much waste of money by investors and of superfluous expenditure by gas consumers. We are apt to complain occasionally of our parliamentary system of control of gas undertakings, and to protest against the cost of Private Acts regulating the relations between Gas Companies and Local Authorities. Yet Mr. Dempster shows in a very graphic way how an extreme license in the disposal of highway rights, and a mistaken estimate of the advantages of competition in gas supply, have conspired to make gas in the United States both dear and bad. Perhaps the last word requires some explanation. We do not mean to imply, and neither does Mr. Dempster insinuate, that American gas engineers are not clever in their business, or that they do not customarily supply the best gas they can produce. The point Mr. Dempster makes, and the importance of which we emphasize, is that—having in most places only a very insecure tenure of their district, being always liable to the inroads of competitors, who are sometimes respectable, but are more frequently mere pirates—the majority of American gas managers have other things to attend to besides that continual polishing up of processes and plant, and have other demands to meet besides that of procuring the best and most improved apparatus, which constitute the chief care of an English manager. There is also in the States more trouble with men than British employers are commonly subject to; and wages are uniformly high without relation to efficiency. American gas managers, moreover, get but small aid, in a financial sense, from their residuals. Ammoniacal liquor cannot in most places be profitably converted into sulphate, even if there were a good demand for the latter, because the towns are so far apart that carriage kills the trade. Evidently, however, an easily workable process for converting ammoniacal liquor into anhydrous ammonia suitable for use in refrigerators and ice-machines would be a boon to American Gas Companies. Tar need not trouble them; for if they cannot sell all their make for asphalting, &c., it can be burnt. The American gas manufacturer is evidently not afraid of cheap petroleum, since he can sell gas at 12s. per 1000 cubic feet, with oil going begging at 5d. per gallon. It is, however, evident that under these circumstances gas is a light of luxury, like electricity; and the combination of the two systems of lighting noticed as a growing practice by Mr. Dempster, is a much more natural process than anything similar would be in this country.

Water and Sanitary Affairs.

A carefully prepared and well-written statement, designed to show at what stage in the course of Metropolitan improvement the London County Council is about to take its start, has just been issued by the Metropolitan Board. A survey is given of the work done since 1855; so that the new comer may not take credit for the achievements of its predecessor. The world soon forgets; and unless a clear and concise record remains at hand, it may happen that London will by-and-bye ascribe to the Council some of the good which has been accomplished by the Board. Attention is also called to the hapless condition of the Metropolis prior to the period when the now moribund authority commenced its labours. The County Council will enter on its career under circumstances widely differing from those which existed prior to 1856. But it is not our business to range through the entire sphere of the Board's operations. Certain details come within our purview; and, so far as this is the case, we happen to be generally at variance with the authority at Spring Gardens. We do not care to join in the prevailing clamour against the Board; but we have occasion to object to some of its proceedings, and we demur emphatically to certain elements of its policy. We hold that its attitude towards the Water Companies has neither been wise nor just. The report, or history—for it is the two combined—in treating of the water supply, tells how Sir John Thwaites, then Chairman of the Board, was a member of the Royal Commission of which the Duke of Richmond was President, which Commission, in 1869, expressed an opinion "that the constant service "system ought to be promptly introduced, to the furthest "extent possible, in the Metropolis." Yet the Board saw fit to quarrel with the regulations under which the constant supply was to be introduced, even though the regulations at first proposed were modified at the instance of the Board and the Corporation. The report tells us "the result has been that the Companies have been "left to take the initiative, as they are empowered to do "under the Act." If there is any virtue in the constant supply, it is fortunate for London that the Companies were thus invested with power, and that they were willing to exercise it. There is an acknowledgment in the report that the constant supply system now extends to very nearly 400,000 houses, or more than half the total number connected with the Companies' mains. If the regulations were unreasonable and oppressive, is it likely that they would receive the approval of a Government department, and that more than half of the houses in London would be thus dealt with? The constant supply has spread; it is still spreading; and the official record goes just so far as to say that all this is done by the Companies themselves, "with the "concurrence of the Board." Following the constant supply, we have the fire hydrants, of which there are now 8807 in the area of the Metropolis, besides 818 within the limits of the City. There is no doubt that these appliances have been of material assistance to the Fire Brigade, and have helped to economize its resources.

The repeated efforts of the Board to appropriate the Metropolitan Water Supply are mentioned in the official history, including the proposed dual supply, and the accompanying Purchase Bill. But the Government never favoured the Board in these efforts; and when the present Lord Cross brought forward his scheme for buying up the Companies, the transfer was to be made to a public body to be constituted for the purpose. All this may be read in the deftly-worded chronicle now before us; and the only note of admiration that enlivens the official pages appears in connection with the statement that the Companies were to have £33,000,000 for property which merely cost £12,000,000. This *ad captandum* way of stating the case is very striking, but is at the same time very delusive. The terms arranged were only those which constituted a *quid pro quo;* and less water stock would have been an equivalent had the rate of interest been more in proportion to the actual and anticipated dividend. But a cry was raised; and Lord Cross had to give place to Sir William Harcourt, who threatened the Water Companies with annihilation if they would not abate their

claims. Yet even Sir W. Harcourt found the water question to be something which lay beyond his strength. An effort was made to re-model the government of London; and so to create a municipal authority which should fight the battle with the Companies. But this scheme also broke down. The Metropolitan Board again stepped forward; and on three several occasions asked Parliament for power to prepare and submit a scheme whereby the supply of water to London should be under the control of a body representing the inhabitants. Still each application met with a refusal. "Thus it will be seen," says the dolorous tale, "that "not only was the Government disinclined to take any steps "towards placing the supply of water under a representative "body, but that all the efforts made by the Board for this "purpose have been discouraged, and the necessary powers "refused." So baffled, the Board set to work in another direction, and sought to "check the continued rise in value" of the Companies' undertakings. The principal result of these efforts was to make the City Chamberlain the trustee of a sinking fund for the redemption of debenture stock. That this was not quite what the Board sought to accomplish is indicated by a sentence, which says: "It may "possibly be thought by the new governing authority of "London that the City Chamberlain is hardly the proper "officer to be the trustee of a fund in which the whole of the "inhabitants of London are interested." Finally, we have a note of exultation over the Water-Rate Definition Act of 1885, and the Regulation of Powers Act passed in 1887. From first to last, in reference to the water supply, it may be said that the Board has refused to do some amount of good which it might have done, and has persistently attempted something which it was not allowed to do. If the County Council gains the confidence of the public and of Parliament, a different chapter from that which we have now discussed may have to be written.

That part of the historical report which refers to the drainage of the Metropolis is interesting as showing the various controversies to which the subject has given rise—resulting in the abandonment of many notions at one time held to be strictly orthodox. The sewage question stands not now where it did twenty or thirty years ago. At the beginning, the Metropolitan Board had to please the Government as to the engineering features of the main-drainage plan, and especially as to the situation proposed for the outfalls. While the Board and the First Commissioner of Works were in vain endeavouring to settle their differences, the Thames as high up as Westminster became so intolerably offensive, that the Government, out of respect to the noses of the Legislature, were forced to capitulate; and the Board was left with a free hand to do the best it could. The present plan of interception was then adopted; the outfalls being fixed at Barking and Crossness. Still, there was an agitation kept up on the subject—both in Parliament and the press—chiefly with reference to the utilization of the sewage, concerning which some very sanguine expectations were expressed. A Select Committee of the House of Commons, in 1862, reported that sewage, when not diluted in an unusual degree, was of great agricultural value. In 1863, another Select Committee recorded its conviction that the utilization of the sewage of London, and of other large towns, might be made to result in pecuniary benefit to the ratepayers. But, despite the *dicta* of blue-books, all the efforts of ingenious and ardent projectors, intent on extracting wealth from the London sewage, have proved abortive; and the only good that has ever accrued to the ratepayers of the Metropolis has consisted in the appropriation of £25,000, deposited with the Board as security for the due execution of the Essex Reclamation Scheme—an enterprise by which the sands of the sea were to be transformed into fertile meadows. The golden dreams so enthusiastically entertained, as to the value of the Metropolitan sewage, were at length dissipated; whereas the conviction that sewage was a nuisance, became more distinctly realized as time passed on. Such is the present state of the case; and the expiring Board takes leave of its work while the finishing stroke is yet wanting. The sewage has been diverted from one part of the Thames; but it enters at another. Extensive and costly works are in progress for the purpose of purifying the outflow; and these the Board leaves unfinished, although with the hope that when they are brought into full operation, "no further pol-"lution will be caused by the discharge of London sewage "into the Thames." It is to be regretted that the Board gives up its trust without being able to place this result on record among its actual achievements.

Essays, Commentaries, and Reviews.

THE AFFAIRS OF THE GAS INSTITUTE.

The first public step has been taken to carry out the resolution arrived at by the late members of the Council of The Gas Institute at their meeting on the 19th ult., and commented upon in the Journal a fortnight ago. The invitation to Engineers, Managers, and Secretaries of Gas Undertakings which we publish below, in accordance with the request of Mr. Alfred Colson, the Hon. Sec. *pro tem.*, and for the reason assigned by him in his introductory remarks, is unexceptionably worded. As we take occasion to observe in another column, the Provisional Committee now in course of formation upon the single basis of acceptance of the one fundamental resolution, will be the real founders of the new organization. It is quite true that acceptance of this resolution implies rejection of the claims of the old Institute to represent the gas industry; and it also means that those who join the Provisional Committee do so in the hope of assisting to create an Association which shall be better than the old one. Beyond this, however, the question of what practical steps may be best for attaining the desired object is perfectly open.

It must not be overlooked that the first meeting of the Provisional Committee will be the earliest opportunity for taking the sense of those who have hitherto been members of The Gas Institute upon the general question. There will not be any meeting of the Institute until June; but the Provisional Committee will assemble at an early date, when every one will have an opportunity of discussing and receiving explanations of the circumstances controlling the origin of this movement. For every reason, it will be too late to do anything useful at the June meeting of the Institute. There is a very natural idea abroad in some quarters which may be expressed as follows:—"I do not see any reason for hurry in starting a new society with the Institute still existing. We can well wait until June, and then express by a vote our opinion of the proceedings of the remnant of the Council, afterwards taking any steps that may seem desirable for the reform of the Institute." Members who hold this view of the situation, which would be rational enough in some circumstances, fail to realize the true state of affairs. Supposing that the fragmentary Council are met in June with such an expression of censure as the rejection of their report. What then? If the majority of members, who unquestionably hold in the main with the seceding members of Council (even if the only evidence regarded is the vote of last June), reject the programme of the Council published in our first number for the year (p. 14), what valid steps could be taken to follow up the blow? If even a resolution in favour of dissolving the Institute there and then were to be carried, the only certain result would be to wreck the meeting for the year. No response could be made to the invitation of the French Society, who expect to receive in Paris their hosts and entertainers of last year; and the Institute would simply break up before the eyes of the public, with much unnecessary aggravation of irritation among the parties to its collapse, who would have paid a year's subscription only to waste time and money on the vain hope of performing an impossibility. For it is to be noted that even the fragmentary Council, in their programme already referred to, propose to relegate "members other than engineers, managers, and secretaries of gas undertakings to the class 'associates.'" Even if such a course were acceptable, it would be as much out of the question to follow it as to deal with the trading members in any other way for the purpose of getting rid of them. The explanation of this point given by our correspondent "Spes" last week is worth this additional reference. Moreover, with such an illustration as was afforded last June of the difficulty of working the old Institute rules, he would be a rash man who should rely upon them again for any critical constitutional proceeding. The Provisional Committee alone have it in their power to deal with the present crisis promptly and satisfactory; clearing everything out of the way in time for holding a regular meeting, and sending to Paris in the summer a truly representative contingent of British gas engineers and managers. We are authorized to state that the immediate responses to Mr. Colson's circular have been very satisfactory. We had every reason to expect such a result; for very many of the private communications with which our subscribers favour us at this time of the year contain most gratifying declarations of agreement with the policy which this movement represents, and of the line taken by the Journal in regard to it. We have never wavered from the conviction that the heart of the industry is sound, although persistent attempts have been made to both poison and beguile it.

It appears that our statement last week regarding the present position of Mr. W. H. Bennett, which repeated current rumour, was not exactly accurate. Within a day or two of the end of the year, Mr. Bennett received a notice from Mr. W. Longworth, as Hon. Sec. *pro tem.* of the Institute, according to which Mr. Alfred Lass, who was one of the Honorary Auditors of the Institute, was to be "engaged to arrange and complete the transfer" of the books, &c., then, and still, in Mr. Bennett's custody. Upon this Mr. Bennett asked, with a view to ascertaining his own legal position, whether his tendered resignation had been accepted; and he was informed, in response, that he was to "understand" that he was "suspended," although no resolution upon the subject had been passed by the Council. Mr. Bennett replied that, in the absence of a proper

resolution referring to the matter, he should decline to consider himself suspended; and requested to be informed of the grounds upon which Mr. Longworth made such an extraordinary statement to him. To this very reasonable demand there was no direct answer; but Mr. Longworth subsequently asked Mr. Bennett to send him certain of the Institute books. In face of the direct resolution that all such books were to be confided to Mr. Lass, Mr. Bennett refused this request. Here the matter rests for the present. Mr. Bennett has not been able to obtain any satisfaction respecting the reasons for "understanding" himself to be suspended; and the Honorary Secretary *pro tem.* has vainly tried to induce him to transgress the only resolution of the fragmentary Council the terms of which have been made known to him. With regard to Mr. Lass, it will be seen, from his communication to Mr. Longworth (which will be found below), that he has declined to have anything more to do with the Institute or its books and accounts. Thus matters have already drifted as nearly as possible into the condition of a deadlock.

THE PROPOSED NEW ASSOCIATION.

Gas Offices, Leicester, Feb. 4, 1889.

SIR,—Will you allow me, through the medium of your columns, to give publicity to the following circular, which has already been widely distributed amongst Engineers, Managers, and Secretaries of Gas Undertakings, and is, I am glad to say, being satisfactorily responded to? If in sending this out, any sympathizers with the movement have been overlooked, I shall be glad if they will kindly communicate with me, with a view to their being placed upon the Provisional Committee. This is greatly to be desired, because our aim is to make the Committee thoroughly representative.

Gas Offices, Millstone Lane, Leicester, Jan. 31, 1889.

Dear Sir,—At a meeting of ex-members of the Council of The Gas Institute (namely, those who have resigned office since June last), which was held in London, on Saturday, the 19th inst., Mr. Charles Hunt in the chair, the following resolution was unanimously agreed to:—

"That a National and Representative Organization is desirable for the Advancement of the Gas Industry."

It was then decided that those present should form a Provisional Committee, with power to add to their number—the intention being to make such Committee as comprehensive as possible; and I have been requested to ask if you will be good enough to allow your name to be added to it. A meeting will be held as soon as practicable, to decide upon such steps as may be necessary; and, in the event of a new organization being determined upon, to adopt measures for drafting the rules and regulations.

The favour of an answer at your early convenience, on the enclosed form if in the affirmative, will much oblige,—Yours faithfully,

ALFRED COLSON, Hon. Sec. *pro tem.*

I hope it will be fully understood that the Provisional Committee stands pledged to no definite course of action. To determine the time and manner of proceeding, so as best to carry the resolution into effect, will have to be its first care.

Perhaps I may be further permitted to ask those who have already received a copy of the circular, but have not yet replied, to do so if possible, not later than the 12th inst.—Yours faithfully,

ALFRED COLSON, Hon. Sec. *pro tem.*

THE RESIGNATION OF MR. ALFRED LASS.

30, *Gracechurch Street, London, Feb.* 4, 1889.

SIR,—Enclosed herewith I hand you a copy of a letter which I have this day sent to Mr. Wm. Longworth, Secretary *pro tem.* of The Gas Institute, containing my resignation as a member of the Institute.—Yours very faithfully,

ALFRED LASS.

[ENCLOSURE.]

30, Gracechurch Street, London, Feb. 4, 1889.

Wm. Longworth, Esq., Gas-Works, Guildford,
Sec., *pro tem.*, Gas Institute.

Dear Sir,—For many years past Mr. Hersee and myself have acted as Honorary Auditors of The Gas Institute. On the 28th of December last, the following resolution was passed by the Council of The Gas Institute at their meeting held on that day, viz.:—

"That Mr. Alfred Lass, F.C.A., be engaged to arrange and complete the transfer of the books and property of The Gas Institute, now in the possession of the Secretary, Mr. W. H. Bennett."

On the receipt of this resolution, I conferred with my colleague, Mr. Hersee, when we decided that, as we had been for many years past, and were now, the official Auditors of the Institute, it would be best for the accounts for the current year to be audited, and the books transferred, in our official capacity as Honorary Auditors, and of which decision you were duly informed; and if the accounts had been ready, the audit and transfer would probably have been completed ere this.

You will, I am sure, be sorry to hear that unforeseen circumstances have arisen which render it undesirable for me to proceed further in connection with the above matter. I therefore tender you my resignation as a member of The Gas Institute.

I regret exceedingly the additional trouble which this decision may probably entail upon Mr. Garnett, the President *pro tem.*, and the members of the Council.—I remain, Dear Sir, Yours very faithfully,

(Signed) ALFRED LASS.

MASONIC.—On Wednesday last, Mr. Donald D. Macpherson, of Manchester, was installed W.M. of the Lodge of Integrity, No. 163; the ceremonial taking place in the Freemasons' Hall, Cooper Street, Manchester, where the regular meetings of the Lodge are held the fourth Wednesday in every month.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 256.)

BUSINESS on the Stock Exchange was only moderately good in the earlier portion of last week; but it improved greatly towards the end. This was aided by the vote of confidence in the French Ministry (which amounts, at all events, to a postponement of troubles), and also by the fall in the value of money. As we prognosticated last week, the Bank rate was again lowered ½ per cent. on Thursday, and now stands at 3 per cent. Good investment securities are consequently in demand. The Gas market has been very fairly active, and extremely firm. Many variations in quotations have taken place, and they are all, without exception, in the upward direction. The demand for choice investments has influenced debenture stocks, and those of The Gaslight and Coke Company have risen freely. The "A" has rapidly recovered from the depression of the previous week, which we noted at the time as being probably of only short duration. It was done on Tuesday as low as 258, from which point it then steadily rose; and the final mark on Saturday—viz., 264—was the best of the week. The rise was aided by the satisfactory character of the Company's accounts for the latter half of 1888, which disclose an improvement of about 3 per cent. in the rental, while residual products have realized prices better by an equivalent of 1½d. per 1000 cubic feet as compared with the corresponding half of 1887. This at once recoups to the Company one-half the value of the reduction in the price of gas—an excellent feature, though we always prefer to see the chief profit come out of the increased sale of gas. In South Metropolitan stocks, all three issues have made further advances, mainly in consequence of the announcement of a reduction of 2d. per 1000 cubic feet in the price of the Company's gas; but no business has been recorded in any one of them. Commercial old is 1 higher; but, to our mind, still stands very cheap. Suburban and Provincial Companies have been very quiet; but Brentford old has risen 1. Some of the Foreign undertakings have been pretty active, especially Continental Union and Monte Video; but they are unchanged. Metropolitan of Melbourne and Bahia are slightly higher. Water has been moderately dealt in every day. The position is firm generally, and one or two issues have risen a little.

The daily operations were: Only moderate business in Gas on Monday, and prices mostly good. Melbournes rose 1. In Water, the West Middlesex quotation rose 2; but actual business marked was below the minimum figure. Gas was quieter on Tuesday, and business was for the most part in Gaslight "A" at easy prices. South Metropolitan "A" rose 3; and Commercial old, 1. In Water, West Middlesex was put back 1. Wednesday's Gas business was much the same as Tuesday's, but at better prices. In Gaslight, the "A" stock rose 2; and the "H" and the 4 per cent. debenture stock, 1 each. In South Metropolitan, the "A" and "B" rose 2 each; and the "C," 5. Brentford old rose 1. Water was more active, but unchanged. Gas business on Thursday was principally in foreigners; but Gaslight "A" advanced 1 more. Water did not present any feature. On Friday, Gaslight "A" showed more activity and strength, as did also the secured issues. The 4 per cent. debentures rose 1; do. 4½ per cent., 3; and do. 6 per cent., 2. Bahia advanced ½. Water was moderately dealt in at the old prices. On Saturday, Gas was firm, quiet, and unchanged. In Water, the only event was a rise of 1 in Lambeth 10 per cents.

ELECTRIC LIGHTING MEMORANDA.

WEST BROMPTON ELECTRIC LIGHTING STATION—THE DUBLIN CORPORATION AND ELECTRIC LIGHTING—A GREAT AMERICAN EDISON COMBINATION.

THE current number of the *Electrical Review* contains a long account of the fitting up of the new West Brompton central station of the House-to-House Electric Light Company. The Editor of our contemporary is of like opinion with ourselves respecting the hollowness of the proceedings at the recent "opening" of this establishment, declaring that the post-prandial oratory upon this occasion was full of "soft nothings," and that everybody will rejoice when the first straightforward history of real work successfully done shall be told. From our contemporary's report, we are enabled to supplement the imperfect account of this Kensington Station which we took from the daily newspapers for last week's "Memoranda." It is stated that three sets of generating plant are put down for the start, each comprizing a 200-horse power horizontal compound steam-engine, made by Fowler and Co., of Leeds, working with a steam pressure of 150 lbs., and running at 88 revolutions per minute. The alternating current dynamos have a maximum output of 100,000 watts. The three 250-horse power boilers are of the Babcock and Willcox multitubular type, rated at the evaporative duty of 10½ lbs. of water per pound of Welsh steam coal. The mains are made of a copper core, cotton covered and steeped in some insulating material, with a sheathing of lead over all. They are enclosed in underground conduits, consisting of common cast-iron gas main-pipes, varying from 3 inches to 6 inches bore, with a draw-box at every 70 yards or thereabouts for pulling out the cables if required. Opposite every two houses is placed distributing boxes arranged in pairs; so that, in the event of one service becoming faulty, the bad lead can be cut out, and the service to the houses put on the main at the adjoining distributor. From the distributing-boxes the services are carried to the converter, which may be either inside or just outside the house; but before reaching it, the service passes through a safety-fuse mounted on porcelain, and thence to a main switch, whereby the current can be cut off. The converter

or transformer, by which the high-pressure current in the mains is reduced to a safe low-pressure current for the lamps in the house, is of the Lowrie-Hall type. Every house supplied is to be provided with a meter registering the current by the electro deposition of copper, according to a process that would take too long to explain. Suffice it to say that all the current for the house is to pass through the meter, the result of which will be the deposition of 0·2354 gramme of copper for every 1000 watts, or one Board of Trade unit, in the circuit. This meter is supposed to be correct within 2 per cent. The indications of the meters will be taken quarterly, and consumers charged at the rates of 1s. per unit for the first 100 hours' consumption of the maximum supply required, 8d. per unit for the second 100 hours, and 4d. per unit for the remainder. There will also be a charge of 5s. per Board of Trade unit consumed per quarter to cover the expense of the meter, instruments, &c., which is decidedly high.

The Corporation of Dublin have decided to apply to the Board of Trade for a Licence for the supply of electric lighting in the city. The last intelligence relating to this subject which reached us from Dublin was to the effect that the Corporation intended to apply for a Provisional Order under the Electric Lighting Act; their chief reason for such action being the notified intention of the Gas Company to do the same. The latter, however, appear to have thought better of it, as we are glad for their sake to learn; and have not proceeded with their application. Consequently the Corporation have slackened off likewise; but not to give up the idea altogether, they think they may as well try for a Licence for undertaking a private electric lighting business. It should be stated that they already rejoice in the possession of a Licence for public lighting, which they have never put into force; and it will be very surprising if any more comes of the present proposal. Of course the *Freeman's Journal* applauds the Corporation decision. This approval, however, rests upon the wholly unwarrantable assumption that the proceeding of the Corporation in the matter will issue in the lighting of Sackville Street in such a fashion that the eyes of Europe will be turned upon this noble thoroughfare. which it is an article of every true Irishman's creed to regard as the finest street that ever was or can be made in the whole world. It is to be hoped the enthusiastic reporters of the *Freeman's Journal* will not grow weary in waiting for that bright vision.

A great electrical combination is announced as having been effected in the United States—the chosen home of "rings," "trusts," and similar highly organized industrial and commercial developments. The various Edison electric light companies, five in number, have all been incorporated in a single concern, with, of course, a large increase of capital. There would be no inducement to arrangements of this class, but for the opportunity for "watering" which they afford. The new organization is to be known as the Edison General Electric Company, with a capital of twelve millions of dollars. How much of this is electricity and how much "water" does not appear on the surface. The President of the new company is Mr. E. H. Johnson, late President of the Edison Electric Light Company. The Company's general factory is to be set up at West Orange, New Jersey, near the factory now engaged in the manufacture of Edison's phonographs. The new Company intend to do everything under the same management—arrange lighting contracts, make the plant and lamps, set up installations, and work them. It is expected that a great impulse to Edison lighting will be given by this consolidation of interests which were previously semi-independent; but it is rumoured by those who are not altogether believers in the Edison cult, that the arrangement has been accelerated, if not caused, by the progress of the Westinghouse and other systems of electric lighting which claim to be cheaper than the Edison method.

Commercial Gas Company.—Mr. Thomas Wrake Ratcliff, the Deputy-Chairman of the Company, has been elected Chairman, in the place of the late Mr. Richard Bradshaw, whose death we recorded last week. To supply the vacancy thus caused in the Board of Direction, Mr. Thomas Bevan, J.P., of Leadenhall Street and Stone Park, Dartford, has been elected a Director.

The New Gas Engineer at Montreal.—It may be remembered that an advertisement appeared in several recent issues of the Journal, inviting applications for the position of Engineer to the Montreal Gas Company, Canada; and Mr. J. F. Scriver, the Secretary and General Manager of the Company, has been in England for the purpose of making the appointment. A large number of applications for the vacancy were sent in; and Mr. Scriver experienced considerable difficulty in making a final selection. Before starting for home, however (as he did last Saturday), he was able to announce that his choice had fallen upon Mr. Sidney E. Stevenson, at present the Engineer of the Colchester Gas Company—a gentleman in every sense well fitted for the position he is about to fill. Mr. Stevenson—who leaves England to take up his new appointment early next month—is the youngest son of Mr. George Wilson Stevenson, the well-known Consulting Engineer of Westminster; and though comparatively a young man, he has had varied experience as a Gas Manager, commencing at Barbadoes in 1872. With an interval passed as Assistant-Surveyor in the town of Derby, he has since been Engineer of the Gas Companies at Bournemouth, Exeter, Lincoln, and Colchester. We can heartily congratulate both Mr. Scriver and Mr. Stevenson on the choice that has been made, and are sure that the latter gentleman will take with him to Canada the best wishes of many professional and private friends.

THE RELATION OF WATER SUPPLY AND DISEASE.

In the issue of the Journal for the 22nd ult., we brought our review of this subject as far as the year 1866. It was in that year that the Legislature passed the oft-discussed measure which, supplementing previous Acts, vested in the Conservators "the Conservancy of the Thames and Isis from Staines, in the County of Middlesex, to Cricklade, in the County of Wilts." The Act made some alterations in the Thames Conservancy Acts, 1857 and 1864, and enacted, by section 63, that it should not be lawful for any person to do any of the following things—viz., (1) To open into the Thames any sewer, drain, pipe, or channel with intent, or in order thereby to provide for the flow or passage of sewage, or for any other offensive or injurious matter. (2) To cause, or, without lawful excuse (the proof whereof shall be on the person accused) to suffer, any sewage or any matter aforesaid to flow or pass into the Thames down or through any sewer, drain, pipe, or channel *not at the passing of the Act used for that purpose*. Similar provisions were introduced for the protection of streams, canals, or watercourses, communicating with the Thames within three miles of that river, measured in a direct line; and for any act or thing done in contravention of the statute, the offender was made liable on summary conviction to a penalty not exceeding £100, and to a further penalty not exceeding £50 for every day during which the offence should be continued. In this connection, it may be well to mention that the Acts of 1857 and 1864 are to be read as one with the Act of 1866, and that the first-named statute enables penalties to be recovered summarily before one justice and to be levied by distress, with power to imprison in default of distress. All penalties are to be sued for within six months. By virtue of the Act of 1864, any penalty or forfeiture recovered by the Conservators in a summary manner is to be paid to them, and to form part of the Conservancy fund.

In order to understand what are the full duties and powers of the Thames Conservators, it would be necessary to have regard to numerous sections of the various Acts, which are too lengthy to be quoted in these columns. It may, however, be mentioned that, when any breach of the before-mentioned provisions occurs, the Conservators are "required," within a reasonable time after knowledge of the fact, to give notice in writing to the offending person or body of persons that the offence must be discontinued within a specified period "not being in any case less than twelve months or more than three years." Another provision of importance is to be found in section 68 of the Act of 1866, which declares that it shall not be competent for any person other than the Conservators or their representatives to institute any prosecution under the Act relative to the flow or passage of sewage or any of the matters already referred to. Of the 91 sections which the Act of 1866 contains, we will only mention one other—viz., section 69, which enacts that nothing contained in the statute shall be deemed to legalize or permit any nuisance or to take away or prejudice any remedy or right which the Conservators or any person might have had or exercised if the Act had not been passed. It was felt that, in the interest of the Metropolis at large, the powers conferred by the foregoing sections were urgently demanded. It was believed that they would enable the Conservancy Board, by preventing the pollution of the Thames and its tributaries, to safeguard the public health from those calamitous onslaughts of disease, of which examples have been cited in our previous articles. But after more than twenty years' experience of the working of the Act, it is admitted on all hands that the confidence entertained when the measure was passed has not been justified. At the present moment, we are face to face with a danger only a few degrees less acute than that which existed when these enlarged, but, as it seems, inadequate powers were conferred upon the Conservators. This, too, notwithstanding the largely increased tax, or rather voluntary contribution now paid annually by the London Water Companies, in reality for the purpose of providing the Conservancy Board with ample sinews of war.

It is desirable to mention briefly the amending measures enacted since the year 1866. In 1867 a fourth Conservancy Act was passed, making those of earlier date apply to the Thames from the City Stone, near Staines, to the western boundary of the Metropolis, and to so much of every river, stream, cut, dock, canal, and water-course communicating with that part of the Thames, as lies within three miles of the river measured in a direct line. Section 5 imposed on the Board the duty, "by all lawful and proper means, to preserve and maintain at all times, as far as may be, the flow and purity of the water" of the river and all its tributaries.

The fifth Act, passed in 1870, provides for the extension of the authority of the Conservators from three to five miles on each side of the river; and the provisions of the Act of 1886 were also extended so as to apply to the Thames from the eastern boundary of the Metropolis to Yantlet Creek. At the same time, the rights of the Metropolitan Board of Works were reserved; and it was enacted that all disputes between that Board and the Conservancy Board should be settled by arbitration. The sixth Act, passed in 1878, substituted ten miles for the three prescribed by the Act of 1866, and the five prescribed by the Act of 1870; this and other amendments being, according to the terms of the preamble, enacted "for sanitary reasons, and for more effectually preventing the pollution and waste of the waters of the River Thames and its tributaries, and with the view of thereby improving the supply of water to the Metropolis and other places." The last-mentioned Act is especially important, as it recites the agreement with the Chelsea,

Lambeth, Grand Junction, Southwark, East London, and West Middlesex Companies (which Companies were already making annual payments for liberty to draw certain quantities of water from the river), and sets forth that the funds available for the protection of the waters between Staines and Cricklade (described as "the upper navigation") were wholly inadequate. It was further recited that the six Companies were willing to make increased payments for the advantages already secured, and for those to accrue under the provisions of the statute. It is by virtue of the payments thus willingly incurred by the Companies, that, apart from other measures, they are fairly entitled to claim a favourable verdict, if it should be inquired whether they have been active or obstructive in regard to the protection of the Thames from pollution by sewage and other noxious matter.

THE ELECTRIC LIGHT AT LEAMINGTON.—Regarding the recent decision of the Leamington Town Council to determine the contract with the Electric Lighting Company, we understand that the latter are willing to put an end to the contract before the expiration of the stipulated twelve months.

THE LEEDS GAS COMMITTEE AND MR. ELLIS LEVER.—At the last meeting of the Leeds Corporation Gas Committee, the Town Clerk read a letter and two telegrams which had been received by him from Mr. Ellis Lever. It was resolved—"That the Town Clerk be instructed not to reply to the communications now read, nor to any further communications which he may receive from Mr. Lever."

THE VIENNA STATION OF THE IMPERIAL CONTINENTAL GAS ASSOCIATION.—Writing on the 28th ult., the Vienna correspondent of *Industries* says: "Notwithstanding the rapid development of electric lighting, the consumption of gas is steadily increasing; and the Imperial Continental Gas Association have found it necessary to increase their works at Oberdöbling, from whence Vienna is supplied. They also propose to establish a new gas-works, for which they have obtained a concession, and the cost of which is estimated at 500,000 florins. The new gasholder about to be erected will be the largest on the Continent. Since this Company are also supplying electric light from their central station in the Schenkenstrasse, they ought to be in a position to judge whether the gas interest is likely to suffer from the electric light; and in view of the proposed extension of their Vienna Gas-Works, this seems not very probable."

DEATH OF MR. D. HULETT.—We regret to have to record the death, on the 26th ult., at his residence, Belvedere, Kent, of Mr. D. Hulett, of High Holborn. The business career of the deceased gentleman began with Messrs. Deville, in the Strand, whose service he quitted to commence on his own account. He then became connected with the now well-known firm of lamp and gas apparatus manufacturers in Holborn, the business of which he carried on successfully for many years, and of which he was the sole proprietor. He early recognized the fact that gas would to a great extent supersede oil as an illuminant; and he therefore allied himself with the leading gas men of the day, and assisted in the establishment of several gas undertakings, in which he held a large interest. In gas engineering, he will be remembered as the inventor and patentee of improvements in gas-meters, as well as of the mercurial governor and the "Standard" washer-scrubber with which his name was associated. His attention to detail, combined with his untiring industry and practical knowledge of the business in which he was engaged, raised him to a prominent position in the gas world. Although for some few years before his death he suffered from failing health, he did not cease to take great interest in the industry with which his life-work had been identified. The funeral took place on Saturday last in Highgate Cemetery.

THE GAS, WATER, AND GENERAL INVESTMENT TRUST, LIMITED.—The letters of allotment and regret of this Trust were posted just as the last number of the JOURNAL went to press; the first issue of capital (£750,000) having, we are informed, been largely over applied for—a result which might have been anticipated, looking at the names of the gentlemen who form the Board and the general character of the investment. The ease with which the Company have found their capital is another proof, if any were needed, of the undiminished confidence of the public in the securities offered by gas and water undertakings. Mr. Jas. A. Kelman has been confirmed in the appointment of Secretary to the Trust—a post to which, apart from his qualifications for the office, he seems to be justly entitled, the scheme having been projected by him, and the successful formation of the Trust being mainly, if not entirely, due to his individual efforts. Mr. Kelman's name has more than once appeared in our columns in connection with inventions relating to gas apparatus and the promotion of gas undertakings. In 1882 he formed the Gas Appliances Company, Limited (of which Mr. G. W. Stevenson, C.E., was Chairman)—a Company which has been steadily making progress by the introduction of its patents into gas-works; and in 1887 he started the South African Gas Company, Limited. This Company, it may be remembered, are erecting gas-works at Woodstock, a suburb of Cape Town, and have obtained liberty to enter Cape Town itself, in competition with the existing Company there. They have also purchased concessions for lighting other rising towns in South Africa. Mr. Kelman was Secretary to both these Companies; but he has resigned these offices to take up his new appointment.

Notes.

FOUNDATIONS IN ALLUVIAL DEPOSITS.

Mr. H. Leonard, the late Chief Engineer to the Bengal Public Works Department, has published in *Indian Engineering* some observations upon a series of experiments carried out by him at Akra with the object of determining the proper proportions of brick foundations in alluvial soil. These experiments were made on a large scale—the piers being of the full working size—and the indications thus obtained are accordingly of strictly practical use. With regard to the amount of pressure that should be permitted upon foundations in alluvial soil, Mr. Leonard found that there was no appreciable sinking with loads up to 1 ton per square foot, while under a load of 2 tons there was decided sinking, sufficient to cause bad cracks. If one part of a building on a soil of this description were made to load its foundation with a weight of 2 tons per square foot, while another part carried 1 ton only, there would in all probability be unequal settlement and bad cracks. Consequently, the load should always be under 1 ton to the square foot; or if necessarily more, it should be equally distributed over the piers. The next tests were made to discover the best depths for foundations in alluvial deposits, and piers were built at depths of 2 ft. 6 in., or just below the surface spit; at 4 feet, where the true alluvium was found undisturbed; at 8 feet, where a different soil was touched; and at 11 feet, where the soil was soft and water-logged. It was finally determined that, in undisturbed alluvial deposits, from 4 to 6 feet is a good depth for footings—to escape trouble both from heavy rains on the surface and ground water below. Local considerations would, of course, affect this general conclusion. With regard to the spread of footings, it was found that, for a pressure of 1 ton per square foot, the foundation should be at least 1 ft. 6 in. thick at the toe, and the stepping thereafter at an angle of not more than 45°.

THE NECESSITY OF VENTILATION FOR THE PRESERVATION OF WALL PAINTINGS.

Mr. Philip H. Newman writes to the *Builder* to draw attention to the necessity for providing for the proper ventilation of churches and chapels lit by gas, especially with regard to the protection of the inside wall surfaces from corrosion and stain. He asserts that he painted, eight years ago, a spirit fresco in a certain London church, which has now been destroyed for want of adequate ventilation in the chancel, the south wall of which is principally occupied by the picture. Large gas standards, he says, have liberally supplied moisture charged with other products of combustion, and "this has been permitted to stream down the walls, scoring the painting, as with a firebrand, in vertical marks, where greater absorption has not allowed the moisture to collect, and blur and deface the colours in wider areas." Mr. Newman points out that there is but faint hope for mural painting where such influences are allowed to work their worst for years. It is admitted that the church authorities have now ventilated the chancel containing Mr. Newman's picture; but the mischief would appear to be done. It is so far satisfactory that even in the height of his annoyance Mr. Newman is able to perceive the real cause of the injury to his work—that it is only indirectly due to gas, and might have been prevented, without alteration of the system of lighting, by proper ventilation, which is too generally neglected in places of public worship, to the great distress of the congregations, as well as to the disfigurement of the interior of the fabric by condensed water containing acid products of combustion and respiration.

THE ORIGIN OF PETROLEUM.

Professor J. S. Newberry recently read a paper, on the origin of petroleum, before the New York Academy of Sciences. The lecturer stated that this is a vexed question as between chemists and geologists. Mendeljeff, the Russian chemist, supposes it to be formed, by natural synthesis, from inorganic elements—in which case its production may be continuous. Professor Newberry asserts, however, that the author of this hypothesis has not had any personal acquaintance with the American oil-fields. In volcanic and metamorphic regions, the required inorganic elements exist abundantly and in juxtaposition; but oil is never found there, as it should be upon Mendeljeff's theory. The geologist finds that oil is always found associated with bituminous shales or limestones. Oil and gas springs occur together in connection with carbonaceous shales, in which they seem to originate, and to be due to decaying organic matter. Petroleum and gas issue from carbonaceous deposits in the ground, just as hydrocarbon gas leaves coal when it is exposed to the weather. The petroleum decomposes in turn, giving up its volatile constituents, and leaving only the pitch; the transition being visible in the pitch lake of Trinidad, which is liquid at the centre and solid round the edges. At one place in the United States, petroleum issuing from the Utica black shales in ancient times has formed seams of anthracite varying in thickness from a sheet of paper to several inches. All these observations indicate the methods of operation of natural agencies through secular periods; but the process may be seen in action on a small scale in any stagnant pool wherein decaying vegetation forms an oily scum on the surface, and marsh gas can be disengaged by stirring up the bottom with a stick. All these phenomena point to vegetable tissue as the origin of the various hydrocarbons, whether gaseous, liquid, or solid. Some small proportion may be of animal origin; but the great deposits must be due to vegetable tissue. If this theory is correct, gas and oil wells must be confined to strata overlying beds of organic matter, such as coal and

its allies. Secondly, gas and oil will flow from such deposits as long as there is any organic matter left. Thirdly, the daily flow must be small, and great accumulations of either oil or gas can only be found where fissures or coarse porous rocks serve as a reservoir, and impervious strata above render escape impossible; thus causing the accumulation in particular places of hundreds of years of daily products. Hence gas and oil wells will continue to flow for ages; but when the stock in the reservoir is exhausted, or the current production is divided among many wells, the products may be so reduced as to be of little or no value. The oil wells of Mecca, Ohio, which, having been once pumped out, are now pumped for a few days only every year, prove the continuous production of petroleum; and records of oil springs that have without diminishing flowed for upwards of 2000 years in different parts of Asia show that the supply is not likely to cease, although steam pumping may exhaust local accumulations.

Communicated Articles.

SOME NOTES AND OBSERVATIONS ON AMERICAN GAS ENGINEERING.

By R. Dempster (of Messrs. R. & J. Dempster), Newton Heath, Manchester.

*** These "Notes" have been kindly prepared by Mr. Dempster, in response to a request made to him by us directly on his return from his recent trip through the United States and Canada; as it was felt certain that much he saw and heard of while away would prove of interest to English gas engineers and managers.—Ed. J.G.L.

As I had the pleasure, a short time ago, of making a hurried tour through part of Canada and the United States, I took the opportunity of calling at some of the gas-works in the towns through which I passed; and the following notes of what I saw may possibly not be without interest to some of your readers.

I found, in the first place, that an American gas manager has usually double, and often treble the amount of capital upon which to earn a dividend as compared with an English gas manager. This arises from a number of circumstances. Materials and labour for erecting gas-works and laying mains cost about twice as much as they do in England. In a large number of cities competition is, and has been, the rule—two, three, and even four companies competing for the business, either by lowering the price or increasing the illuminating power of the gas supplied. This sort of thing goes on for a time, and then the directors of the different companies find it would be better to amalgamate. After negotiations have been settled, the amalgamation takes place, and a "consolidated company" is the result. Thereupon the price of gas is immediately raised to an amount that will pay a dividend upon the total capital invested, although half of it may have been spent uselessly; the result being that the public grumble. It may be asked: "Why is this permitted? Have not the gas companies Acts of Parliament to secure their monopoly?" The answer is: "No; but they get an ordnance from the city authorities to open the streets, supply gas, &c." All goes on well until some patentee or financier, who owns or controls some new patent for making coal or water gas, visits the town, gets the ears of a few members of the Council and explains to them that if he had power to put down his plant, he would supply gas at a much lower price than the old company. For a time they do not seem to see it; but after the exercise of a little patience and perseverance, these councillors suddenly discover that a great benefit would be conferred on the city by having competition in the supply of gas. Why should they not have it for gas as well as for everything else? The result is that an ordnance is passed. In some cases the financier will then offer his ordnance to the old company, provided that they give him an order, at an unreasonable price, for one of his so-called "patent" plants, in which event he would not build separate works, lay new mains, &c., as the old company could then supply cheap gas by having his apparatus. The company may think this the less of two evils, and buy out their competitor by the purchase of one of his plants, even if only to keep it idle. (I called at one works, where this had actually been done.) If the terms are not accepted, the result is competition, which is followed by consolidation; and the consumer finds he has to pay such a high price for his gas as will produce a dividend on the money wasted on two works, two sets of mains, &c. This kind of thing has its influence on shareholders as well, owing to their company not having a complete monopoly; for they fear that they may any day have competition. They therefore prefer to charge a high figure for their gas, in order that they may have large present profits, instead of charging a reasonable price, being satisfied with a just return, and having faith in the concern as a sound investment with a fair dividend-earning capacity for the future. This insecurity has its effect in hampering both engineer and directors in the matter of extensions. If they had a complete monopoly, they would launch out boldly when constructing new works and extending their mains, and would make them of ample size to supply the district properly for many years.

The system of management adopted in American gas-works appears to be different from that in vogue in English works. The chairman (who is styled the "President") of the concern often undertakes the duties performed here by the engineer. He is expected by the shareholders to be a man who thoroughly understands the manufacture and distribution of gas; and, as a rule, he spends a good deal of time both at the offices and on the works. Very often the engineer is promoted to the position of president, if he should be so fortunate as to be a shareholder, even if only a small one. The salaries of gas managers are about double what they are in England. A good many managers keep their own horse and "buggy," which is absolutely necessary, owing to the extensive area covered by American cities.

The construction of American coal-gas works is, in general, like that of English works; but in some points American works differ from ours. The retort-benches are charged from the floors; but great numbers have the stage-floor arrangement. Different works have their particular retort-settings, with all the various forms of gaseous and regenerative furnaces which are in vogue. American managers appear to be feeling their way carefully with regard to gaseous firing, just as their brethren are doing here. They go in for getting a high yield of gas per mouthpiece; and, even where ordinary furnaces are used, 10,000 cubic feet per mouthpiece is quite common. As a rule, they employ large retorts, and I do not think they have so many different shapes and sizes as we have. (*En passant*, I would ask: Why cannot we have a standard shape of ⏢ and oval determined, and then only allow three sizes of retorts from each ⏢, oval, and round to be made?) The flues of the retort-benches in most cases come just a few feet above the top of the bench, where they belch out their flames, heat, and smoke. One engineer tried to make me believe that this was better than having chimneys to carry away the products of combustion. I asked him if this plan did not produce a great deal of dirt and smoke in the retort-house, and make it disagreeably hot in warm weather; also if it did not affect the ironwork of the roof; and, further, whether the long-continued heat did not make the roof slates brittle, &c. He said it did not; but I am not convinced, and still think it best to take the combustion products outside by means of a chimney or chimneys.

I noticed in my travels quite a number of curiously-shaped hydraulic mains, designed, I suppose, with the object of preventing them from becoming blocked up with pitch. The mains are generally of cast iron in one continuous length, and not in separate lengths to each bed of retorts as the English custom has been for some years. The American engineers seem to have a weakness for keeping them close to the top of the retort-bed. If they would raise them a couple of feet, so that the heat of the bench did not affect them, the necessity for adopting such curious shapes would, in some measure, be obviated.

The condensers are always placed under cover (as, in my opinion, they should be, whether in America or elsewhere), and are generally of the multitubular class, with small pipes inside an outer cistern, and controlled by means of water. They work fairly well, I believe; but the vessels struck me as being too small for the quantity of gas they are expected to condense, and the Americans have more trouble with naphthalene than we experience. It is true that with this class of condenser, the gas on entering encounters the warm water first, and gradually meets the cold water at the outlet; but when the cubical capacity of the condenser is so small that the gas is only from 10 to 30 seconds passing through it, the sudden condensation is liable to produce naphthalene. In connection with this matter, I may remark that I am not aware of any experiments having been made, either in this or any other country, with the view of obtaining data to determine what is meant scientifically by the terms "sudden" and "slow" condensation. I observed that a few of Pelouze and Audouin's condensers have been introduced into America.

With regard to scrubbing, I noticed that the Americans do not give so much attention to this department of gas purification as we do on this side of the Atlantic. They treat ammonia more as a nuisance to be got rid of than as a source of profit. One engineer told me they did not care to worry themselves about making 1 cent per 1000 cubic feet from ammonia, when, by giving attention to other matters, they could save at a strike from 4 to 5 cents per 1000 feet. I pointed out that even 1 cent per 1000 feet, when considered at the end of the year, would be an item of some importance. Scrubbers and washers are, however, in use; but I got the impression that they did not know how to use them to the best advantage.

There are very few places where sulphate of ammonia is made. I was told it was exported to England in order to find a market, and yet I find that this country shipped 14,000 tons of sulphate to America last year. I understand that a profitable business is being done by a few companies who buy the ammoniacal liquor from the gas companies (paying them for it at the rate of about 1s. per ton of coal carbonized), and convert it into aqua ammonia, which finds a ready sale for producing anhydrous ammonia for ice making, and for cooling breweries, shops, &c., during the continuance of hot weather.

I only saw two forms of exhausters at work—viz., the Roots (which somewhat resembles the old Jones exhauster) and the Mackenzie.

I think the American gas engineers allow for larger purifiers for their make of gas than is the custom in this country. This may be the result of the irregular production where water-gas plants are in use; and no doubt it is also in great measure due to their not using scrubbing appliances to greater advantage. Their purifiers are lightly constructed, however, as compared with our modern English-made ones. This may be owing to the price of iron in America being double that charged in England. The purifier covers have generally flat tops, stiffened outside with T bars. One cannot go into English gas-works without noticing the endless

variety of designs of appliances for raising the covers of purifiers; whereas in America they seem to have only one, which is, however, a good one. It consists of a double "Goliath," connected together in the form of a square by light girders. The lid is lifted, without any straining, from four points, which are generally at or near the corners. The whole is mounted on large wheels 3 feet or 3ft. 6in. in diameter, so that the friction is light, and the machine can be propelled by simply pushing it. Steam-pipes are always laid under the lutes, to prevent them from freezing.

Station meters are all made round, irrespective of size; and to me they appeared old fashioned, owing to my being accustomed to seeing square ones. I noticed that some very large meters had been cast in one piece. But the modern practice is more sensible, and they are now being made in segmental plates with planed joints.

With regard to gasholders, at one works I saw a novelty—viz., a single-lift holder, 110 feet in diameter, which was guided by a central pillar 18 inches thick, and the ordinary bottom rollers. The pillar was stayed from columns placed on the side of the tank. This holder had been working satisfactorily for a number of years. Except in the case of small holders, the columns are rarely made of cast iron, but of $\frac{5}{16}$ or $\frac{3}{8}$ inch wrought-iron plates. They are jointed with straps placed inside, and riveted flush on the outside. The vertical joint faces towards the holder, and is partly hidden by the guide-rail. When finished and erected, the columns appear to the eye to be formed of one piece. The bottom and top parts are made very strongly of cast iron, with bold ornamental mouldings on. The round column is being departed from, and plated or latticed standards are taking its place in most of the new works. In telescopic holders I found channel-iron was almost universally employed for the cups; and I was told that there are at present only two holders in America with bent cupping. While in Chicago, I was privileged to inspect a 3-million cubic feet gasholder which was being erected by Messrs. R. D. Wood and Co., of Philadelphia, who had adopted a novel plan of putting up the columns and girders. The first lengths were erected from the ground; then the hoisting tackle was fixed in a suitable way on the top of the holder. The vessel was next blown up with air, and the second, third, and fourth tiers of columns were lifted from the holder, which was further raised a tier as each tier of columns was erected. On this holder a hand-rail was fixed on each cupping, so that in frosty weather men could walk round safely when clearing ice out of the dips. The constructors had also fixed syphon tubes to run the superfluous water out of the dips into the *inside* of the holder, so that any overflow from the dips would not run down the outside and form ice in frosty weather. In the Northern States, gasholders are generally put under cover. Sometimes the holders stand in ornamental brick houses with slated roofs; at others they are protected by a corrugated-iron house supported by the gasholder columns. At one works I found the engineer (who was an Englishman) had constructed a roof over a holder 95 feet in diameter without having tie-rods across the roof. This was accomplished by using a 6-inch angle-iron on the top of the brick walls, and constructing the roof like an arch—making the angle-iron into a circular tie-rod.

During my tour, I met with a considerable number of Connelly's automatic governors, with which the engineers using them were well pleased. This appliance puts on and takes off the pressure automatically according to the *volume* of gas passing through it. Having once fixed upon the minimum and maximum pressures at which it is desired to work, it does not require any further attention, except oiling, from one year to another. Owing to its being self-acting, the governor is more likely to put on and take off the pressure at the right moment than any arbitrarily fixed-time system. A great deal of unnecessary pressure is thus kept off the mains; leakage being, as a consequence, considerably reduced.

(To be continued.)

THE CHEMISTRY OF ILLUMINATING GAS.

By NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.G.S.

VI.

The relative cost of an illuminating agent, as we have seen, is by no means an exact indication of its value to the user. One important point that is irrespective of cost is that of the accompanying effects—such as the production of heat, the vitiation of air, or the evolution of irritating or poisonous substances. It is impossible to produce, if one may use the expression, "pure" light. That term may represent the form of force required; but whatever known means we resort to for its production, certain other results are unavoidable. When combustion of a hydrocarbon, or any inflammable substance, is the means adopted, there is also a generation of heat and of products of combustion. In connection with artificial lighting, therefore, it is desirable to consider the nature of its effects, as regards considerations of health and comfort.

The views held by the earlier investigators into phenomena of this nature were of a simple character. They regarded products of combustion as a sort of necessary nuisance, and held that the smaller the quantity generated the better; and that one advantage to be urged in favour of gas was that it vitiated the air to a less degree, light for light, than candles or oil. To a certain extent this is correct, but not necessarily so in its entirety. The electric light, for instance, does not evolve any products of combustion or use any oxygen; yet there are many varieties of circumstances where a combustible illuminating agent, energetic in both these respects, might be preferable. The question is intermixed with that of ventilation. If the light is to be produced in an unventilated room, then the view just expressed would undoubtedly be correct, and the electric light would be much more preferable than any other agent. But it happens that most of the places where artificial light is required are used or inhabited by human beings; and therefore efficient ventilation is necessary, apart from all questions relating to the artificial light. For example, we are told that the consumption of a cubic foot of gas in a room is about equal in air-vitiating effect to the presence of one person. A room in which a gas-burner cannot be used without producing evidences of insufficient ventilation is therefore unfit to be occupied by even a small number of persons for any length of time. If an electric light is substituted for the gas-burner, the defect is concealed rather than remedied; and the presence of three or four beyond the usual number of occupants would produce all the evils supposed to be due to the gas. Many years ago, when the importance of fresh air was less appreciated than it is in these days, the substitution of the arc lamp for the fishtail burner would have been considered an efficient remedy. But now it would be insisted that proper ventilating arrangements were also necessary. The electric lamp is perfectly neutral, but the objectionable products of combustion can be turned to account, and made to convey not only themselves, but also a sufficient quantity of vitiated air from the apartment, to enable proper ventilation to be effected. Thus the hurtful products of combustion may be rendered useful as serving a beneficial purpose, and an enemy is converted into a friend. If we assume (and the assumption is not a bold one) that proper ventilation is to obtain, then the question of the products of combustion enters upon a new phase, and we are not warranted in concluding that a neutral or a very feeble agent in respect to production of heat and vitiated air is necessarily the better.

Mr. Lewis Thompson was one of the first to direct attention to this subject.* He stated that the composition of ordinary 13-candle coal gas, in parts by weight, was 72 per cent. of carbon, 26½ per cent. of hydrogen, and 1½ per cent. of oxygen. The composition of wax, he said, was 78 per cent. of carbon, 12 per cent. of hydrogen, and 10 per cent. of oxygen; and these figures approximately represented the composition of oil. It is evident that all the combustible materials used for the production of artificial light have a strong family likeness. They are comprised under the titles of gas, oil, and candles; and of these gas contains, weight for weight, more hydrogen and less carbon than the others. Any nitrogen or oxygen that may be present does not affect the question. From the above figures it would appear that 1 lb. of oil or wax would, in the act of burning, combine with 3 lbs. of oxygen (from the air), thus—

0·12 lb. hydrogen	+ (0·12 × 8) lbs. oxygen	= 1·08 lbs. water vapour.
0·78 lb. carbon	+ (0·78 × $\frac{8}{3}$) lbs. oxygen	= 2·86 lbs. carbonic acid.
1·00 lb. combustible	+ 2·94 lbs. oxygen	= 3·94 lbs. of products of combustion.

In this calculation, the 10 per cent. of oxygen present in the combustible is allowed for as assisting in the reaction. The 0·9 lb. of hydrogen and carbon really require 8·04 lbs. of oxygen, of which 0·1 lb. is furnished by the combustible itself; leaving 2·94 lbs. to be supplied from the atmosphere.

Applying a similar calculation to the coal gas, we find—

0·265 lb. hydrogen	+ (0·265 × 8) lbs. oxygen	= 2·385 lbs. water vapour.
0·720 lb. carbon	+ (0·72 × $\frac{8}{3}$) lbs. oxygen	= 2·64 lbs. carbonic acid.
1·000 lb. gas	+ 4·025 lbs. oxygen	= 5·025 lbs. of products of combustion.

The 1½ per cent. of oxygen may be left out of consideration.

These calculations, though useful for certain purposes, do not afford any indication of the relative hygienic values of the lighting agents, since, as Mr. Lewis Thompson observes, the comparison of different illuminants by weight is of little use, seeing that the light afforded is in no sense dependent on the weight of material employed. In order to arrive at some sort of practical test, he instituted a series of experiments; taking the Argand burner, passing 5 cubic feet of gas per hour as a standard, and so arranging the lamps, &c., as to consume the other illuminants to the best possible advantage, and to produce an equal amount of light. They were successively submitted to a known quantity of air by being enclosed in a small chamber; the rate of deterioration being judged by the length of time that elapsed before the flame was extinguished. The flame that lasted the longest had, of course, the least effect on the air; and the results show that, light for light, coal gas is the least deleterious. They were as follows:—

Colza oil was extinguished in	71	minutes
Olive "	72	"
Russian tallow "	75	"
London "	76	"
Sperm oil "	76	"
Stearic acid "	77	"
Wax candles "	79	"
Sperm "	83	"
13-candle gas "	98	"
28 "	152	"

Mr. Thompson also quotes experiments which show that, light for light, gas produces less heat than the other agents. In the course of a lecture delivered at the Royal Institution in 1853, Dr. Frankland agrees with the above conclusions, † and also refers to the volume of carbonic acid produced by various illuminants when burnt in sufficient quantity to yield a light equivalent to 20 standard candles. The hourly production of carbonic acid is stated

* See JOURNAL, Vol. III., p. 473. † *Ibid.*, p. 157

as follows:—Candles, 8·3 to 10 cubic feet; sperm oil, 6·4 cubic feet; gas, 2·3 to 5 cubic feet, according to quality.

The following table, extracted from the report of a lecture delivered by Dr. Letheby before the British Association of Gas Managers in 1864, * furnishes some interesting details of the relative value of different illuminating agents in respect to their heating and vitiating effects on the atmosphere, when burning so as to give a light equivalent to 12 standard candles:—

	Heat Produced. Units.	Oxygen Consumed. Cub. Ft.	Carbonic Acid Produced. Cub. Ft.	Air Vitiated. Cub. Ft.
Cannel gas	1950	3·30	2·01	50·2
Common ,,	2786	5·45	3·21	80·2
Sperm oil	2325	4·75	3·33	83·3
Benzol	2326	4·46	3·54	88·5
Paraffin	3619	6·81	4·50	112·5
Camphine	3251	6·65	4·77	119·2
Wax candles	3831	8·41	5·90	149·5
Sperm ,,	3517	7·57	5·27	131·7
Stearic ,,	3747	8·82	6·25	156·2
Tallow ,,	5034	12·06	8·73	218·3

A very instructive lecture was delivered before the British Association of Gas Managers in 1878, by Mr. Thomas Wills,† in which the subject is fully dealt with. It may therefore be commended to the careful perusal of all interested in this matter. The following illuminating agents are taken into consideration—viz., sperm candles, sperm or colza oil, paraffin oil, and coal gas. The first point is their composition by weight, which is given as follows:—Sperm candles, 80 per cent.; hydrogen, 13 per cent.; oxygen, &c., 7 per cent. Sperm or colza oil are similar in composition; paraffin oil contains less carbon and more hydrogen; being intermediate in this respect between candles and gas, which contains 55 per cent. of carbon and 41 per cent. of hydrogen. A standard sperm candle burning for one hour will produce 0·41 cubic foot of carbonic acid, and 145 grains of water vapour. Gas of 16-candle power would therefore yield 6¼ cubic feet of carbonic acid, and 2320 grains (or 4½ ounces) of water per hour. Sperm oil and colza oil would be about equal in respect to products of combustion; and paraffin oil would yield rather less carbonic acid. A cubic foot of coal gas would give out, on combustion, rather more than 0·5 cubic foot of carbonic acid and 372 grains of water vapour. The gas would require the oxygen contained in between 5 and 6 cubic feet of air for complete combustion; and the vitiating effect of the various illuminants may thus be represented as follows:—Coal gas, 1; paraffin oil, 1·5; sperm oil, colza oil, or candles, 2. The amount of carbonic acid and water given off by the combustion of sperm candles, light for light, is therefore about twice as much as that produced by coal gas. Mr. Wills also remarks that an adult human being exhales with his breath about 0·7 cubic foot of carbonic acid per hour.

Mr. Wills proceeds to consider the effect of artificial illuminants as regards a healthy state of the atmosphere. The normal proportion of carbonic acid present in pure country air is 4 parts in 10,000; and he calls 6 parts in 10,000 the "healthy limit" which ought not to be exceeded. But, as a matter of fact, it is impossible to keep below this limit in ordinary buildings; and therefore 10 parts in 10,000 (which is really a bad atmosphere) is the outside limit assumed by Mr. Wills for the purpose of his calculations. According to this, it is evident that the quantity of carbonic acid added to the air of an inhabited room, from any source, should not exceed 6 parts in 10,000. For the combustion of 5 cubic feet of gas, the special use of 4500 cubic feet of air is required, and for one adult individual 1166 cubic feet are needed, per hour. Given a room of 5660 cubic feet capacity, a gas-burner may consume at the rate of 5 cubic feet of gas per hour in it, and one adult may occupy it for one hour before the limit of vitiation can be reached; and it follows that if a healthy condition of the atmosphere is to obtain, a sufficient degree of ventilation must be provided to enable the air of the room to be completely changed once an hour. Or, to put it another way, not less than 100 cubic feet of vitiated air should leave the room every minute, and be replaced by a corresponding quantity of fresh air.

Mr. Wills took, as a further illustration of this important subject, the room in which the lecture was delivered. Estimating the capacity at about 60,000 cubic feet, and the air as containing the normal proportion of 0·4 per cent. of carbonic acid, it would follow that only 36 cubic feet of carbonic acid would suffice to reach the undesirably high proportion of 0·1 per cent.—that is, assuming no change of air to be taking place. Ten gas-burners in use, and ten men occupying the room for one hour, under these conditions, would reach that limit. But it was no unusual thing to have 25 burners in use, and 100 individuals occupying the room; in which case 112,500 cubic feet of air would be required for combustion, and 116,500 cubic feet for respiration—a total of 229,000 cubic feet, or nearly four times the contents of the room. So that, in order to keep within the undesirably high limit above stated, the cubic contents of the room should be changed not less than four times every hour. A current of air moving at the rate of more than 16 inches per second is a draught; and therefore this could not be effected by direct incoming and outgoing of air. But the lecturer proceeded to draw attention to, and fully illustrate (by means of well-selected experiments) a cause which, although generally unknown and unsuspected, is really the chief factor in securing ventilation in ordinary dwelling-houses. This is a process of diffusion constantly going on through the walls, ceilings, and floors of rooms, by means of which the vitiated air is constantly being replaced by fresh. This diffusion is due to differences of density between the inside and the outside air. The inside air may be charged with impurities or elevated in temperature; either cause being sufficient to alter its density and set up the action of diffusion. Unfortunately this action is comparatively limited; so that this interesting phenomenon is not to be relied upon as capable of affording sufficient and proper ventilation. Mr. Wills found that diffusion took place most rapidly through dried mud. Bricks came next; then limestone; and lastly sandstone. In any case the air in a room cannot be entirely changed more than three or four times per hour; therefore care should always be taken that the vitiating influence is not so energetic as to be capable of gaining upon this rate of diffusion.

* See JOURNAL, Vol. XIII., p. 412. † *Ibid.*, Vol. XXXII., p. 126.

AT the Kilham Rolling Mills in Sheffield, the rod furnaces are being heated with water gas by Brook's patent method, and the result is stated to be a success.

MR. JOHN AIRD, M.P., will preside at the forty-fifth anniversary festival dinner of the Iron, Hardware, and Metal Trades' Pension Society, to be held at the Hall of the Ironmongers' Company in May.

M. FLOCHAT has published in the *Comptes Rendus* of the French Society of Civil Engineers a memorandum on the subject of the burning of small fuel. Many appliances and arrangements have been introduced for burning small fuel such as sawdust, coal and coke dust, tan, &c.; but there is always the difficulty of the great quantity of ashes which has largely prevented the general use of such appliances. An apparatus in which small fuel may be successfully burnt is a simple gas generator in the side of which opens a flue intended to convey the flame to a boiler or a furnace where the heat is required. In the case of wood fragments, the generator is lit up by burning a fagot on the hearth; and before this fagot is quite burnt out, the fuel to be gasified is introduced from above in a steady stream. The result is an extraordinary elevation of temperature, a volume of flame escaping by the flue already mentioned, and the production of a certain quantity of carbonized material, which falls down to the bottom of the generator. From this material is made wood charcoal of good quality. The only precaution necessary for the perfect working of a generator of this kind with sawdust fuel is that the latter must be perfectly dry. A generator 1·2 metres wide, and of a height ranging from 1·5 to 2 metres, will heat a boiler 4 metres long and 1 metre in diameter. At a wood-working factory, a generator of this description utilizes ends of wood rods which are cut in fragments 2 centimetres long. There are said to be no cinders; but it is not known how much moisture the small fuel may contain without interfering with the efficiency of the furnace.

ANOTHER addition to the host of technical journals has been made recently in the publication of No. 1 of the *Telephone*, which is apparently intended to represent in the journalistic sense the growing interest from which it takes its name. The first number or two of this periodical very worthily struggle to justify the title, containing as they do several articles and communications relating to telephony. Whether this will continue to be the principal feature of the new journal remains to be seen; but already the Editor betrays a tendency to eclecticism, devoting a portion of his news columns and much of his outer space to general electrical matters. It is an interesting subject of thought and discussion for the student of languages, to consider the way in which new expressions grow into common use. The very title of this journalistic venture was unheard of a very few years ago; and now it is an indispensable part of the English language. It would be difficult to say with accuracy who first coined and put into circulation the word telephone. It is a handy term, and has therefore become popular. The ease with which people drop into using some new words of this character is as remarkable as is the difficulty of supplementing them with other words that seem called for by the community. Thus while the noun telephone, meaning the instrument, has of necessity given birth to the verb to telephone, meaning the use of the instrument, there is no word to signify the result of this operation, or the message which is telephoned. There was the same difficulty in the early days of telegraphy, when the cumbrous phrase "telegraphic message" had not been supplanted by the word telegram. One of the first tasks of our young electrical contemporary is to discover an analogue to this well-known word, which shall mean the message spoken through the telephone, as telegram means the message written from the telegraphic signals. Telephonic message is too big a mouthful, and takes too long to write in these busy times; but none of the single words suggested answers the requirements, all being too fanciful. In this emergency the public are drifting into the use of the word telephone to mean the work as well as the instrument, such phrases as "Referring to your telephone this morning" having been met with in business letters. This is obviously bad, for it is a sign of poverty of language to use the same word in different senses, and is a practice that leads to confusion of ideas. Electricity is full of linguistic pitfalls, however; the nomenclature of electric lighting being anything but settled. Experience is not favourable to the attempt to force the adoption of a cut-and-dried vocabulary upon the practitioners of a new art or science; spontaneous generation, as mysterious as the genesis of slang terms, and as irresistible, being required for words that are to live in men's minds and fall trippingly from their tongues.

Technical Record.

THREE-LIFT HOLDER FOR SYDNEY GAS-WORKS.

DESIGNED AND CONSTRUCTED BY MESSRS. C. & W. WALKER, OF LONDON AND DONNINGTON.

THE SPECIFICATION FOR THE WORK.

When describing last week, the eighth (and last) drawing of the Sydney holder, it was stated that the specification under which the work was carried out would be published to-day. In its essential features, it was as follows:—

Dimensions.—The inner or upper lift is to be 199 feet diameter, by 40 feet deep at the sides. The middle lift to be 201 ft. 6 in. diameter, by 40 feet deep. The outer or lower lift to be 204 feet diameter, by 40 feet deep.

INNER LIFT.

Rise of Crown.—The crown, which will be untrussed, is to be a true segment of a sphere, having a rise of about 12 ft. 6 in. in the centre.

Crown Plates.—The outer row of the crown plates, forming part of the top curb, will be 4 feet wide, and $\frac{5}{8}$ inch thick. The second row from curb to be $\frac{1}{2}$ inch thick. The centre plate will be 5 feet diameter by $\frac{3}{8}$ inch thick; and the row next the centre to be $\frac{7}{16}$ inch thick. The whole of the intermediate plating to be of No. 10 Birmingham gauge, prepared for rivetting with $\frac{1}{4}$-inch rivets, 1 inch apart, centre to centre.

Side Plates.—The top row of side plates adjoining the top curb will be 1 ft. 6 in. wide, by $\frac{1}{2}$ inch thick; and the next row 2 feet wide, by $\frac{1}{4}$ inch thick. The bottom row, which forms one side of the hydraulic cup, to be $\frac{3}{8}$ inch thick. The whole of the intermediate plating will be No. 11 Birmingham gauge, prepared for rivetting with $\frac{1}{4}$-inch rivets, 1 inch pitch.

Top Curb.—The top curb will be constructed with an outer ring of angle iron, 6 in. by 6 in. by $\frac{3}{4}$ in. thick, rivetted to the strong crown and side plates; and an inner ring of 6 in. by 4 in. by in. angle iron rivetted to the outer row of crown plates which also forms part of the curb), at a distance of 3 ft. 6 in. from the outer ring. The joints of both rings are to be closely butted, and provided with strong angle-iron cover-plates of equal section

Vertical Stays.—There will be 44 vertical stays placed at equal distances round the circumference of the inner lift, each extending from the top curb to the bottom of the hydraulic cup, and constructed of rolled joist iron, $9\frac{1}{2}$ in. by $4\frac{1}{2}$ in. by $4\frac{1}{2}$ in., having vertical plates 12 inches by $\frac{1}{4}$ inch at the back of each stay, to which the side sheets are rivetted. A strong gusset-piece, having a frame of 3 in. by 3 in. by $\frac{1}{2}$ in. angle-iron, and a web-plate $\frac{3}{8}$ inch thick, will be prepared for attachment to the upper end of each vertical stay, forming a stiffener between the two angle irons of the top curb, as shown on the drawing.

Hydraulic Cup.—The hydraulic cup is to be 18 inches deep, and 10 inches wide, constructed of channel iron, $9\frac{3}{4}$ in. by $3\frac{5}{8}$ in. by $3\frac{5}{8}$ in. The cup plate will be $\frac{3}{8}$ inch thick, strengthened with a bead of half-round iron $2\frac{1}{2}$ in. by $\frac{5}{8}$ in., rivetted along the outer edge.

Carriages and Rollers.—There will be 22 cast-iron guide-pulleys mounted on strong wrought-iron sliding-carriages, provided with elongated holes for adjustment, and prepared for bolting to the $\frac{3}{4}$-inch crown-plates, and to the outer angle-iron of the top curb. The guide-pulleys will be bored and turned on the face, and fitted with strong wrought-iron turned axles. There will be 44 guide-rollers, bored and turned on the face, in wrought-iron carriages, prepared for fixing on the bottom of the hydraulic cup to work against the channel-iron guide-stays of the middle lift.

Manlids.—Preparation will be made in the crown plating for two Livesey manlids; one each fitted over the inlet and outlet pipes, and one ordinary manlid on the opposite side of the crown.

MIDDLE LIFT.

Hydraulic Dip and Cup.—The hydraulic dip at the top, and the cup at the bottom of the middle lift are to be an exact counterpart in section of the cup on the inner lift already described.

Side Plates.—The top and bottom rows of side plates, forming one side of the hydraulic dip and cup, are to be $\frac{5}{16}$ inch and $\frac{3}{8}$ inch thick respectively. The whole of the intermediate plating to be No. 11 Birmingham gauge, prepared for rivetting with $\frac{1}{4}$-inch rivets 1 inch pitch.

Vertical Stays.—There will be 44 vertical guide-stays of channel iron, 6 in. by $3\frac{1}{4}$ in. by $3\frac{1}{4}$ in. by $\frac{1}{2}$ in., extending from the dip to the bottom of the hydraulic cup, and prepared for attachment to both. At the back of these channel irons, a plate 12 in. by $\frac{1}{4}$ in., will be rivetted, to which the side sheets are attached, as in inner lift.

Guide Rollers and Carriages.—There will be 22 cast-iron guide-pulleys mounted in strong wrought-iron carriages, prepared for fixing on the dip of the middle lift. There will be 44 guide-rollers bored and turned on the face, in wrought-iron carriages, for fixing on the bottom of the hydraulic cup, to work against the channel-iron guide-stays of the outer lift.

OUTER LIFT.

Hydraulic Dip.—The hydraulic dip at the top of the outer lift is to be an exact counterpart in section of the cup on the inner lift already described.

Side Plates.—The top row of side plates forming one side of the hydraulic dip, and the bottom row adjoining the bottom curb, are each to be $\frac{5}{16}$ inch thick. The whole of the intermediate plating to be of No. 11 Birmingham gauge, prepared for rivetting with $\frac{1}{4}$-inch rivets 1 inch pitch.

Vertical Guide-Stays.—There will be 44 vertical guide-stays of channel iron, 6 in. by $3\frac{1}{4}$ in. by $3\frac{1}{4}$ in. by $\frac{1}{2}$ in., extending from the dip to the bottom curb, and prepared for attachment to both. At the backs of these channel irons, vertical plates 12 in. by $\frac{1}{4}$ in. will be rivetted as in the middle lift.

Bottom Curb.—The bottom curb will be constructed with two rings of angle iron 7 in. by $3\frac{1}{2}$ in. by $\frac{5}{8}$ in., prepared for strongly rivetting to the bottom row of the side plates. The joints of both rings are to be closely butted, and provided with strong angle-iron cover-plates of equal section.

Guide Rollers and Carriages.—There are to be 22 cast-iron guide-pulleys, mounted in strong wrought-iron carriages, prepared for fixing on the dip of the outer lift; and 44 guide-rollers in cast-iron carriages, prepared for fixing between the angle-iron rings of the bottom curb—one being opposite each of the guides in the tank. The whole of the rollers to be turned on the face, bored, and fitted with strong turned wrought-iron axles.

GUIDE-FRAMING.

Wrought-Iron Standards.—There are to be 22 wrought-iron lattice girder standards, about 122 feet high overall, having a roller-path up the front, formed of a strong bulb and flange rail, weighing about 85 lbs. per yard, and extending to within 2 feet of the top of the standard. Each standard will be provided with a massive cast-iron base plate, as shown on drawing [No. 2]; the top surface being planed perfectly smooth to fix the standard upon. The central portion of each standard will be about 7 feet wide at the base, tapering to 2 ft. 6 in. wide at the top, and will be constructed with a front member of two angle irons, each 6 in. by 6 in. by $\frac{1}{2}$ in., prepared for a strong attachment to the rail forming the roller-path; and a back member formed of two angle irons 6 in. by 6 in. by $\frac{3}{4}$ in., extending from the base to the top of the standard, and curved round at the top to meet the front member. The lattice bars forming the web of this portion of the standard will be 5 inches broad, by $\frac{1}{2}$ inch thick, from the base to the first tier of girders; 4 in. by $\frac{1}{2}$ in. from the first to the second tier of girders; and 3 in. by $\frac{1}{2}$ in. from the second tier of girders to the top of the standard. The web will have horizontal struts of double tee-iron, as shown on the drawing. The front portion of each standard will be 4 ft. 6 in. wide at the base, tapering to 2 feet wide at the top, and will be constructed with two members, each formed of two angle irons 6 in. by 4 in. by $\frac{1}{2}$ in. extending from the base to the top of the standard, curved at the top, and strongly connected to the central portion. The lattice bars forming the web of the front part will be of the same breadth and thickness as specified for the central portion of the standard. The horizontal bars will be of flat iron, the same sections as the diagonal bars. Strong wrought-iron plates $\frac{1}{2}$ inch thick will be provided in the web of the front portion, where the trellis-girders are connected to the flanges, as shown on the drawing. The back member of the central portion, and the two vertical members of the front portion of the standards, will be strongly braced together at intervals with stiffening brackets of 5 in. by 4 in. by $\frac{1}{2}$ in. tee-iron. Each standard is to have a strong wrought-iron sole plate $\frac{3}{4}$ inch thick, to suit the cast-iron base plate. Preparation to be made for securing the standard to the sole plate with 6 in. by 6 in. by $\frac{3}{4}$ in. angle-irons and $\frac{1}{2}$-inch plates in the webs of the standard, as shown on the drawing.

Holding-Down Bolts and Plates.—Each standard will be provided with four holding-down bolts $2\frac{1}{2}$ inches diameter, by 16 feet long, and anchor plates 9 inches wide, by $\frac{5}{8}$ inch thick, for building in the brickwork of the piers.

Girders.—The standards are to be connected together laterally with three tiers of strong wrought-iron girders 2 feet deep, as shown on the drawing. The top and bottom flanges will each be constructed of two angle irons 5 in. by 3 in. by $\frac{1}{2}$ in. thick; and the trellis bars are to be of 3 in. by $\frac{1}{2}$ in. flat iron. The ends of the girders will be prepared for connecting to the standards with $\frac{1}{2}$-inch plates and angle irons as drawn.

Diagonal Bracing.—There will be three tiers of strong diagonal bracing, to be fixed between the standards, as shown on the drawing—the lower tier being $1\frac{3}{4}$ inches diameter; the middle tier, $1\frac{5}{8}$ inches diameter; and the upper tier, $1\frac{1}{2}$ inches diameter. Where the diagonal ties meet in the centre of each bay, they are to have screwed ends passing between two rings of flat iron $4\frac{1}{2}$ in. by $\frac{3}{4}$ in., and fitted with double nuts for tightening.

Wind-Ties.—At the top of the standards, provision will be made for horizontal wind-ties of round iron $1\frac{1}{2}$ inch diameter, extending from each standard to the alternate one, and supported in the centre by a bracket projecting from the top of the intermediate standard, as shown on the drawing. Preparation will be made for securing the screwed ends of the wind-ties through the webs of the standards with double nuts and bevelled washers.

Tank-Guides.—There will be 44 vertical guide-bars of channel iron 6 in. by $3\frac{1}{4}$ in. by $3\frac{1}{4}$ in. by $\frac{1}{2}$ in., prepared for fixing to the walls of the tank with cast-iron brackets and $\frac{7}{8}$-inch Lewis bolts. The lower ends of the guides to pass between the landing-stones at the bottom of the tank

INLET AND OUTLET PIPES.

The inlet and outlet pipes will be 36 inches internal diameter, arranged as shown on the drawing; the straight pipes being of wrought iron, and the syphons, duckfoot bends, and T-pipes of cast iron. All flange joints faced in the lathe. The wrought-iron pipes will be constructed of boiler plates $\frac{7}{16}$ inch thick, lap-jointed throughout with flanges of angle iron 4 in. by 3 in. by $\frac{7}{16}$ in. faced in the lathe. The vertical pipes in the tank are to have a bead of

2½ in. by ⅝ in. half-round iron rivetted on the top edge as drawn. The duckfoot bends will be strongly bracketted to the base plates and the T-pipes and syphons will each be fitted with blank flanges. Two 36-inch valves will also be supplied—one for inlet and one for outlet.

Painting, Packing, &c.—The whole of the work comprised in this specification is to be put carefully together at our works, painted once, and marked for re-erection. All small bolts, rivets, and small parts will be packed in cases or casks; and all the work will be protected for shipment where necessary.

Materials.—The whole of the materials will be the best of their respective kinds; and the workmanship throughout will be of the highest possible character, and to the entire satisfaction of your Inspecting Engineer.

THE NEW HOLDER OF THE CONSOLIDATED GAS COMPANY OF NEW YORK.

In the JOURNAL for Nov. 27 last, we gave an illustration and a few particulars regarding the new gasholder which the Consolidated Gas Company of New York have erected between Fifteenth and Sixteenth Streets of that city. The holder has now been completed, and the *American Gaslight Journal* has recently described it in more detail than did the contemporary from whose columns we obtained the information for our previous article. It may be mentioned again that the whole of the work in connection with the holder and tank was constructed by the Continental Iron-Works, of Brooklyn, represented by Mr. T. Fitch Rowland.

There are many noticeable features in the design of this holder, prominent among which are these: First that the tank is the largest metallic reservoir in the world, it having a capacity of over 9¼ million gallons of water, which weighs about 35,000 tons; and, secondly, the working capacity of the holder being equal to 3,300,000 cubic feet, shows it to be the largest in America. The ground where it was desirable that this structure should be placed was found to be unstable; and it being impracticable to excavate and build a tank of masonry, it was decided to construct it of steel. This rests on a foundation, the top of which is about 6 feet below the grade of the streets. It is formed of a bed of concrete supported by a number of piles. The tank measures 193 ft. 3 in. inside diameter; and is 42 ft. 6 in. in depth. The upper edge is surrounded by a circular box-curb, 5 feet in width, supplying the requisite rigidity to the top. This curb is sustained in part by 24 steel buttresses, 6 feet deep, at the base of the tank. The outer faces of the buttresses are finished with a very broad channel-bar, curved to meet the outer edge of the curb. In addition to the buttresses, there are a number of intermediate brackets joining the curb to the tank sides. The shell of the tank is 1⅜ inches in thickness through the lower courses; gradually decreasing to ¼ inch in thickness at the top. Several of the lower courses are formed in two thicknesses; and all the vertical seams are butted and joined with butt straps suitably riveted. The tank bottom is arranged with due regard to expansion. It is provided with a circular expansion joint, placed about 12 feet inside the shell, which allows the bottom plates to move without tearing the joints. A substantial iron railing is placed around the outer edge of the box-curb, forming a convenient passage-way around the tank.

The guide-framing is secured to the top of the box-curb, and consists of 24 steel columns, 124 feet in height. They are formed of heavy steel merchant beams, faced in the flanges with wide plates; and the guide-rail consists of a 6-inch beam, arranged with its web forming a gutter for the radial wheels of the holder sections. The columns are held in vertical position by four tiers of box-girders placed at equal distances, and are sufficiently wide to afford easy passage from column to column. In addition to the girders, there are 48 series of ribband braces, arranged to pass diagonally around the system of columns and embracing them; thus forming the strongest practicable combination. The credit for this general arrangement of diagonal bracing is acknowledged to be due to Mr. George Livesey. The column heads have horizontal diagonal bracing to give greater rigidity.

The gasholder is formed of three sections, of the following respective dimensions: Outer section 190 ft. 4 in. diameter and 40 ft. 6 in. in height; middle section, 188 feet diameter and 41 feet in height; inner section, 185 ft. 8 in. diameter, and 41 ft. 6 in. in height. The hydraulic cups are 8 inches wide and 18½ inches deep. The dips are 9 inches wide, with an effective depth of 24½ inches, which is obtained by arranging the dip-plate to rise 6 inches above the top of the section; the upper edge being fitted with a projecting cover over the cup, which prevents the water being blown out of the cup by the wind. The crown of the inner section is trussed; rising 7 feet above the curb. This curb is of cellular box construction, and forms a substantial ring for the reception of the ends of the crown trusses and vertical stiffeners on the sides. There are 48 of the latter, spaced equally around the holder's sides. The outer plate of the vertical stiffener is made of a ribband extending between the heavy top and bottom courses, and forming a portion of the shell. The intervening space between the heavy courses and the vertical ribbands is filled with regular courses of gasholder sheeting, arranged in equal plates extending in one length from ribband to ribband, to which they are riveted. This arrangement presents a smooth surface, with a minimum of riveted joints; and as they are from three to four times the area of ordinary-sized gasholder plates, this arrangement is more advantageous than the method of using smaller plates. The crown sheeting is arranged in radial courses, with plates about 12 feet long. It is supported on 24 main trussed rafters and 72 secondary and tertiary trussed rafters, resting in part on a main king-post 30 inches in diameter and 45 ft. 6 in. in height. The entire trussed frame is thoroughly braced with purlins and diagonal stiffeners. The crown guide carriages are of wrought iron, fitted with radial and tangential wheels, as first introduced by Mr. Livesey. The under side of the cup has internal rollers to operate on the inside stiffeners of the adjoining section. The middle and outer sections are similar to the inner section in all their general characteristics. The sides are stiffened by inside and outside channel-bars, which are riveted to the vertical ribbands; the inner bars forming tracks for the cup rollers of the adjoining section.

The bottom curb of the outer section is formed of 6-inch by 6-inch angle-bar, reinforced on the under side by a flat bar ½ inch by 6 inches. At intervals, opposite the 24 tank channel-rails, are placed the guide-wheels. The dips of both sections are fitted with radial and tangential wheels, arranged on adjustable wrought-iron carriages. Proper steam-heating arrangements are fitted to the cups for heating the water. The structure in its entirety presents, it is said (and as the illustration we gave on Nov. 27 last indicates), a very imposing appearance.

THE UTILIZATION OF CONCENTRATED AMMONIACAL LIQUOR FOR THE MANUFACTURE OF MANURE.

In the JOURNAL for July 24 last (p. 163), brief allusion was made, in the course of our notice of the papers read at the Boulogne Congress of the Société Technique du Gaz en France, to a communication read by M. Chevalet on the above subject. The full text of the paper is contained in the recently issued volume of the Society's Transactions for the past year (with a copy of which we have, as usual, been favoured); and as the subject dealt with by the author is of much importance to gas managers generally, it calls for the more extended notice which we are now in a position to give.

Alluding, in the course of a paper read before the Society in 1886, to a new apparatus for concentrating ammoniacal liquor which he had described therein, M. Chevalet remarked that he proposed to dispense with the use of sulphuric acid in the manufacture of manure, by the production of a material containing so large a quantity of ammonia that agriculturists or makers of artificial manure would be able to employ it just as it was for this purpose. This idea has now been realized, and is being practically applied. In carrying out the author's system, the first thing to be done is to erect his special apparatus for producing the ammoniacal liquor, concentrated to the degree required for the manufacture of manure—an apparatus which has been adopted in several gas-works, and is so simple in operation that it does not need the constant attention of a workman, whose services are, in fact, only required to run out the liquor, and see that all the ammonia has been extracted therefrom. It is the manager's business to watch the progress of the operation, and ascertain, by inspection from time to time, the degree of concentration which the liquor has attained. When the desired strength (say, 18° to 20° Baumé, or 19 to 20 per cent. of ammonia) has been reached, the liquor may be utilized for the manufacture of manure. To do this, the ordinary commercial superphosphates of lime are taken and spread out over a brick or stone floor, and then formed into a heap with a hollow or depression in the centre (just as is done by masons when mixing mortar), into which is poured a sufficient quantity of liquor to neutralize all the acid contained in the superphosphate. The exact amount will be soon ascertained by experience; but, at all events, the manufactured manure should not smell of ammonia, otherwise there will have been excess, and consequently loss. The liquor is poured into the hollow formed in the heap, and quickly covered with the stuff to ensure its absorption; a further quantity of free superphosphate being added, and the whole made into a good pile and allowed to remain—the opposite process, in fact, to that followed in making mortar or superphosphate of lime. When the operation is performed quickly, there is no evaporation of ammonia, but simply a liberation of carbonic acid, sulphuretted hydrogen, and hydrocyanic acid. Owing to the latter fact, however, the work should be done in a well-ventilated shed, in order that the workmen may not be affected thereby. On the following day the heap is examined; and if it is found to throw off an odour of ammonia, a clear indication will be afforded that too much liquor has been employed. It is then cut with a shovel, and mixed up, after which it is ready for storing or putting in bags.

In analyzing the stuff for selling purposes, portions are removed from various parts of the heap, well mixed together, and a single sample taken, which is tested for the presence of nitrogen in the state of ammonia, as well as for phosphates soluble in water, citrate of ammonia, or acids. By mixing ammonia with superphosphate of lime, the free-acids of the latter are neutralized, a compound of sulphate and phosphate of ammonia is formed, the phosphoric acid soluble in the liquor is precipitated, and a "bibasic" phosphate, as chemists say, is produced. By this operation sulphate and even phosphate of ammonia can be made without the aid of lead evaporating vessels, acid flasks, or drying; all that is done is to render the superphosphate insoluble.

The advantages of this process to the manufacturer of artificial manure are, that by its adoption he will be able to obtain sulphuric acid much more cheaply than that which is put into flasks, and that there will be no breakages of the latter or other accidents incidental to other processes. With regard to the manurial value of the material made in the way above described, M. Chevalet claims that it is capable of producing on the ground the same effects as the mixture of superphosphate of lime and sulphate of

ammonia usually employed. As, however, a large quantity has already been used in agriculture, he expects to be able to lay some definite results before his colleagues at their next meeting.

M. Chevalet is of opinion that his process will gradually make way. One of its advantages over the manufacture of sulphate of ammonia is that it will enable managers of small gas-works to produce concentrated liquor and sell nitrogenized manures in the localities where they are employed; whereas sulphate of ammonia, apart from certain inconveniences attending its manufacture, is generally only saleable to makers of manures. The material resulting from the author's process (which he calls "neutral phospho-guano") keeps very well in store or in bags; it does not become damp or lose its nitrogen; it dries rapidly when it is spread out, and therefore can be easily scattered over the ground with a sowing-machine, which is not always the case with superphosphates. He considers that when the material becomes better known to farmers, the production of small and middle-sized gas-works will be insufficient to meet the natural requirements of the immediately surrounding districts.

THE USE OF LIQUID FUEL FOR HEATING BOILERS.

The Annual Meeting of the Institution of Mechanical Engineers was held on Wednesday and the two following evenings last week; and at the first sitting Mr. T. Urquhart, Locomotive Superintendent of the Grazi and Tsaritsin Railway, South-East Russia, read a paper describing the use of petroleum refuse as fuel in locomotive engines. Since Nov. 1, 1884, the whole of the 143 locomotives under Mr. Urquhart's superintendence have been fired with petroleum refuse, besides fifty stationary boilers and a number of heating and other furnaces. In the six-wheeled engines the average cost of fuel per engine-mile had been reduced from 7·64d. for coal in 1882 down to 4·43d. for petroleum refuse in 1887; being a reduction of 42 per cent. In the eight-wheeled engines the reduction was from 11·02d. for coal in 1882 down to 5·84d. for petroleum refuse in 1887, which was a saving of 47 per cent. The equivalent of 100 tons of coal in 1882 in the six-wheeled engines was 55 tons of petroleum refuse in 1887; being a reduction of 45 per cent. in weight of fuel. The saving of weight in the eight-wheeled engines was 49 per cent. in 1887—that is, 51 tons of petroleum refuse were equivalent to 100 tons of coal. These broad comparisons, extending over a whole year's running with each fuel, include, of course, all the ordinary fluctuations both in working and in condition of the engines. With a locomotive in first-class order and in the hands of a skilful driver, the author had no hesitation in saying that 50 tons of petroleum refuse were equal to 100 tons of first-class coal; while in special trials this ratio had even been exceeded. Some special trials made in 1883 and 1884 showed that the equivalent of 100 tons of anthracite was 48 tons of petroleum refuse; being a reduction of 52 per cent. in weight of fuel. The coal-burning engine ran six double journeys, and the petroleum engine twenty-four, with the result per ton-mile that 45 tons of petroleum refuse were equivalent to 100 tons of anthracite; being a reduction of 55 per cent. in weight of fuel per ton-mile. Five years' experience, the author said, had shown that since the introduction of petroleum refuse as fuel, the cost of repairs has been considerably diminished from what it was previously when firing with anthracite, which was particularly destructive to the fire-boxes and tube ends. In 1882, the last year in which coal was used alone, the repairs cost 4·7s.; while in 1887, when burning wholly petr oleum refuse, the cost had fallen to 2·3s.—being a reduction of 51 per cent. The petroleum flame produced in reality no more detrimental effect on the fire-box and tubes than a wood flame, owing to the protection afforded to the more important parts by the fire-brick lining used.

In the course of the discussion which followed the reading of the paper, it was stated by Mr. Holden that the Great Eastern Railway Company had at Stratford works for the production of gas from shale oil to supply about 750 of their carriages. At one time they had a market for the tar from those works. But about three years ago the market failed, and they could not get rid of the tar in any way. It became a serious matter to know what to do with the tar. Under these circumstances, he was induced to make some experiments with the view of burning the tar; and they were so far successful that subsequent to that time they had been using not only the tar from the shale oil distillery, but also tar from the Beckton Gas-Works and green oil, in boilers of various descriptions. By the system he had adopted on the Great Eastern Railway, he did not use liquid fuel alone; but made use of a very thin fire with bars about 3 inches thick just as a basis of combustion, and injected the tar in the locomotive through two spaces by means of a very small injector. The results financially, of course, depended entirely upon the relative value of coal and liquid fuel. With liquid fuel at the prices they charge themselves with—viz., 1d. per gallon, which was about the price they paid for tar and green oil, the economy was not very large. They obtained most perfect combustion, without any smoke, with very little noise, and without any smell. There was a good deal of difficulty in getting over the smoke business at first; but that was ultimately surmounted by using, in addition to the ordinary injector, jets of steam, which crossed the issuing jet of liquid fuel, which was partially broken up by bars; and it was pulverized very thoroughly with air, so as to get the requisite amount for combustion. The steam pressure kept it clear, and there was no deposit on the inside of the fire-box.

Register of Patents.

LIQUID METERS.—Tylor, J. J., of Newgate Street, London. No. 1478; Jan. 31, 1888. [8d.]

This invention relates to improvements in that class of water-meters in which two uncontrolled, unconnected, or independent pistons or rams are employed, each of which is so related to the valve arrangements of the other, that each piston or ram, at some point of its stroke, reverses the valve of the other. It more particularly relates to improvements in patents No. 3007 of 1880, No. 968 of 1883, and No. 9033 of 1886; and its objects are: First, to cheapen the construction of the slide-valve faces of such meters; second, to lighten the pistons or rams thereof, whereby increased sensitiveness and greater regularity of flow are attained with low pressure or small quantities of liquid; third, to obviate or mitigate the shock or blow at the end of the stroke of the piston or ram; and, fourth, to increase the accuracy of the registering mechanism.

GAS-ENGINES.—Abel, C. D.; communicated from the Gas Motoren Fabrik Deutz, of Deutz, Germany. No. 3020; Feb. 28, 1888. [8d.]

This invention relates to the class of gas motor engine in which the engine operates with a cycle of four strokes—viz., drawing in the combustible charge, compressing the same, the firing and working stroke, and expelling the products of combustion. It has for its object to obtain increased power and useful effect from such engines; and it consists in a modified method of working whereby—firstly, there is admitted to the cylinder charge at the end of the suction stroke, a charge of compressed air or other non-combustible gas under a certain pressure, so as to increase the volume of the charge, and give it an initial compression before the compressing stroke; and, secondly, at the end of the working stroke, a portion of the combustion gases are caused to pass into a reservoir, in order to be further utilized by subsequently performing work in expanding.

For effecting these objects the following construction of engine is, by preference, employed:—The engine cylinder, closed at both ends, communicates at the front end—*i.e.*, the end opposite that at which the combustible charge is admitted—with a reservoir; there being two communicating passages, one at the extreme end of the cylinder, and a second one that is uncovered by the piston as it completes its suction and working outstrokes. Furthermore, there is provided at the front end of the cylinder a valve serving both for the inlet of air and the escape of combustion gases to and from the front end of the cylinder. The back end of the cylinder being provided with the usual chamber for the compressed charge, the valve for the admission of the combustible charge, the escape-valve for the products of combustion, and the igniting-slide, worked by a countershaft moving at half the speed of the engine-shaft, the action of the engine would be thus—Assuming that the reservoir is filled with air or other non-combustible gas under pressure, the piston on completing its suction outstroke, uncovers the communication between the reservoir and cylinder, so that a portion of the air under pressure will enter the latter; thus increasing the cylinder charge, and putting it under an initial pressure. The piston then performs its instroke for compressing the charge; and at the same time the air or gas, still remaining under a certain pressure in the reservoir, will expand into the front end of the cylinder, and assist in the work of the compressing stroke until it has expanded down to atmospheric pressure. Then the before-mentioned inlet and discharge valve will be opened, so as to allow atmospheric air to enter while the piston completes its compressing stroke. On the compressed charge being now fired (causing the piston to perform its working out-stroke), the valve may be either closed or open, so as either to cause the air in front of the piston to be compressed into the reservoir, or to allow it to escape into the atmosphere. In the latter case the valve is, however, closed before the piston uncovers the communication with the reservoir; so that, when this takes place, a portion of the combustion gases will pass into and be stored up under pressure in the reservoir, and when the piston performs its following in-stroke for expelling the combustion gases from the cylinder in the usual manner, it will pass into the front end of the cylinder and in expanding perform work. When the piston has completed its expelling stroke, the valve to the front end of the cylinder is opened, so as to allow the combustion gases under pressure still remaining in the front end of the cylinder to escape into the atmosphere; and on its being again closed, the piston (in performing its suction out-stroke at the commencement of the next cycle) will compress the combustion gas and air in front of the piston into the reservoir through both passages. The engine is then in the condition first described; and the cycle of operation is repeated.

IGNITING APPARATUS FOR GAS-ENGINES.—Abel, C. D; communicated from the Gas Motoren Fabrik Deutz, of Deutz, Germany. No. 3095; Feb. 29, 1888. [8d.]

In patents No. 11,444 of 1887 and No. 688 of 1888 were described appliances for igniting the charges of gas motor engines by means of an externally heated tube, in which the passage leading back from the igniting port of the engine cylinder to the igniting-tube had an extension beyond the latter, so as to form a chamber for the reception of a portion of the combustible charge, which entered the passage and heated the igniting-tube on opening the slide or valve establishing the communication between these parts and the cylinder port. The present invention relates to an improved arrangement of the passage, igniting-tube, chamber, and slide or valve, so as to insure—firstly, that the combustion gases that remain in these parts shall be effectually cleared out of the passage before the entrance of the next charge of combustible gas; and, secondly, that the gases remaining shall be reduced to atmospheric pressure before the entrance of the next combustible charge, so as to enable the latter to effectually penetrate into it and to effect its certain and rapid ignition.

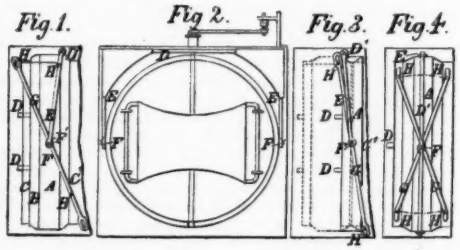
For this purpose the parts are arranged as follows:—The valve or slide, which opens and closes the communication between the cylinder and the parts, instead of being situated immediately against the cylinder (between it and the passage leading to the heated firing-tube), is situated between the passage and the firing-tube; and the before-

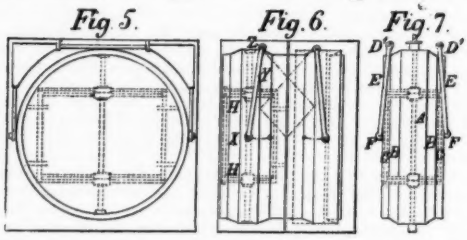
mentioned chamber is made to communicate with the passage at a point between the valve or slide and the cylinder, so that the chamber and passage are always in communication with the cylinder. Furthermore, the valve or slide is so actuated by a cam or eccentric, that the communication between the cylinder and the passage, and the chamber and heated igniting-tube, is kept open during the working stroke, the expelling stroke, and (in some cases also) during the suction stroke of the engine. During the compression stroke, however, the communication with the igniting-tube is closed; the passage and chamber still remaining open to the cylinder. The result of this arrangement is that, during the expelling and suction stroke—the several parts being open to the atmosphere—the residual combustion gases from the last ignition will be free to escape until they are at atmospheric pressure; and on the following compression stroke, the small volume of combustion gases remaining in the passage will be readily forced into the chamber by the compressed combustible charge entering from the cylinder. The passage thus becomes entirely filled, and the chamber partially so by such charge; so that on the valve or slide being now opened, only combustible gas will enter the igniting-tube, and thus insure a certain and rapid ignition of the charge.

Dry Gas-Meters.—Warner, W. J., of South Shields. No. 3373; March, 1888. [8d.]

The object of this invention is to construct the diaphragms of dry gas-meters so as to form measuring chambers of a more determinate and unvarying capacity than has hitherto been the case, which is effected by forming the rim of the ordinary disc diaphragm (which has previously been of leather) of metal and leather bands combined.

Fig. 1 is an end elevation of the diaphragm chamber; and fig. 2 is a front elevation of it. A is a metal zonal-band connected on one side by a band of leather B to the front metal disc C, and on the other edge by another band of leather B^1, to the hoop or rim C^1, soldered to the division-plate of the meter. The centres and paths of action are indicated in fig. 3 by the dotted lines. The interior of the diaphragm chamber is shown emptied; the whole having passed from the dotted lines and closed against the division-plate or partition. In this movement, the disc C enters the bands A, and passes over the rim C^1; the two





edges of C and C^1 meeting in the middle of A. By the reverse action or return stroke (the chamber being inflated or filled through a channel in the rim C^1), the diaphragm chamber expands—C and A gradually receding from C^1, and also C from A, till the full stroke is made, these movements being regulated and controlled by the gearage. Thus the planes of attachment of the disc and rim respectively pass their planes of attachment to the zonal-band. By this arrangement, as far as the travel of the disc is concerned, the quantity of flexible surface is reduced to half the depth of the ordinary leather band; the zonal-band taking the place of the other half. In the example shown, the stroke is 2 inches, which in the ordinary diaphragm necessitates a band of leather 2 inches in depth, excluding the slack necessary for freedom of action. With the zonal-band as shown (it being half the stroke or travel), only 1 inch is required, which is again reduced one-half, excluding the slack as before. Thus the stroke of the 2 inches will be maintained; and the greatest depth of unsupported leather will be but ½ inch instead of 2 inches.

Several modifications may be made in the construction and action of this form of diaphragm chamber. The relative proportions of the zonal-band and flexible material may be varied; and the relative positions of zonal-band and the rims to which the leather is attached may also be varied—the zonal-band working within, instead of over, the back and front rims. The form, too, may be changed from a circular in front elevation to an angular one; the front plate (enclosing the band and rims) having the edges of the leather attached as is usual in framed diaphragms—such as the "Defries"—the leathers being "blocked," as by this maker, to suit the form employed. Or, the leathers may be cut to suit the form, and sewn at each angle. If the rectangular be employed, the end view of the diaphragm chamber will be similar in outline to the circular shown. In action, the changes may be from a moveable zonal-band to a fixed one with two discs moving in and out of the zonal-band, one on each end of it. Or the two discs may be fixed, and the zonal-band, with a gas-tight partition-plate, made the moveable portion of the diaphragm chamber. In this case there will be two distinct and separate chambers, the channels or gas-way into each of which would be through a disc.

The gearing necessary for the action of these arrangements of diaphragm chambers is for the support of the several moving parts, and for the relative motions of the same. In one arrangement the disc and zonal-band have to be suspended or supported; in another, the two discs, the zonal-band being fixed; and in the third, the zonal-band has to be supported through its action, the discs being fixed. The relative motions of the parts of the several arrangements are: The first, the disc and zonal-band move parallel with each other and with the division-plate of the meter, and also in the same direction, but at different rates of speed; in the second arrangement, the discs move parallel with each other and the zonal-band, and each of the discs at the same speed, but always in opposite directions; in the third arrangement, the zonal-band moves parallel with the two discs, and to-and-fro between them. In figs. 1 and 3 the same arrangement is shown at the two ends of the stroke. The disc is supported in the usual way at D by the "flag," and the zonal-band by the rod D^1 (a flag wire) across the top of the diaphragm chamber working in metal bearings and carrying an arm E at each end connected to the zonal-band by two studs, one of which is shown at F, the other being at the opposite side of the zonal-band. Working upon these studs are the arms G (fig. 3), the extreme ends of which are slotted to receive the pins fastened to the disc and rim, as shown at H. The action is indicated by the dotted lines. It will be seen that in travelling to C^1, C and A move parallel with each other and with C^1, and that A passes through half the distance of C (from F to F^1), while C passes from H to H. An arm similar to E—but not shown in the drawing—attached to the division-plate of the meter, and connected to the lower part of A will prevent any tendency of A to move from the perpendicular by turning on F.

Fig. 4 is a view of the top of a diaphragm chamber, with the top of the body or valve-plate removed, showing the rod D^1 and arms E for supporting the zonal-band A; the disc being supported at D by a flag. The parallel gearage is shown by dotted lines, as placed in the interior of the diaphragm chamber. The arms G work upon the vertical rod F passing across the zonal-band and fixed to it; and at the extreme ends of the arms are fastened wires working in slotted guides at H—the front elevation being shown at fig. 5. The end view of this internal gearage applied to the duplicated disc arrangement is shown at fig. 7; the discs being supported by D^1, and the arms E and joints F. In another arrangement, the two discs are suspended by rods and arms; but the internal gearage is modified. The upper end of the vertical rod (which is loose) is continued through the stuffing-box on the top of the diaphragm chamber; and on this rod are fastened the arms coupling the discs. The plan of gearage for the duplex chamber arrangement is given at fig. 6. The ordinary wire gearage is placed in one of the chambers for the parallel action of the zonal-band, which is sustained by a bridle, formed of the flag-rod Z and arms Y, passing under and over the diaphragm chamber as shown; being attached to the zonal-band by the studs X. This bridle arrangement for supporting the zonal-band may also be used for the single diaphragm chamber, as shown at fig. 6; the internal gearage of fig. 4 being employed, but with the rod placed horizontally instead of vertically, and the top connecting wires of the gearage at H being jointed movements instead of slotted ones, as are all the others. These jointed arms support the disc, and work through the slotted guides fastened to the division-plate within the back rim.

The patentee says that advantage may be taken of this construction of diaphragm chamber to pass a greater volume at each stroke without a material alteration of the tangent and its gearage. He prefers, however, a moderate depth of stroke; as what is most to be desired is a diaphragm chamber of unvarying capacity, and unaffected by varying speeds. In this respect, too, from its greater rigidity of parts and lessened quantity of leather, the meter may be worked at a greater speed; and with a very small quantity of gas passing, the lessened quantity of porous material will be an advantage. The distinguishing feature of the invention is "a contracting and expanding chamber of the usual capacity with a lessened quantity of leather, or with a much increased capacity with only the usual quantity of leather."

Gas-Engines.—Oechelhaeuser, W. von, Dessau, Germany. No. 2913; Feb. 27, 1888. [8d.]

The patentee—a gas engineer of considerable note in Germany—has given much attention to the perfecting of the mechanical parts of gas-engines; and therefore some extracts from his specification of a somewhat lengthy character will be interesting.

He says: In the gas engines or motors heretofore known, in which the work accumulated in the gaseous fuel is directly utilized, the combustion is effected by igniting a mixture of combustible gas and air previously obtained in the cylinder or a chamber directly connected with the same. The inflammability of the final mixture here depends upon the proportion of the combustible gas to that of oxygen. Thus, for instance, for ordinary illuminating gas having a lighting power of about 16 candles, only those mixtures of gas and atmospheric air—apart from indifferent gases—are inflammable which contain about 1 volume of gas and from 4 to 14 volumes of air. So that, for example, a mixture which contains 1 volume of gas and only 3 volumes of air is just as little inflammable as one that is composed of 1 volume of gas and 15 volumes of air. As, moreover, the ignition of the charge in the cylinder must be effected with a certain amount of rapidity, and the mixtures approximating these limits burn too slowly, the mixing proportions practically adapted for gas engines or motors are still less than those here given.

In the above-mentioned example, for illuminating gas of a lighting power equal to 16 candles, the mixtures are between 1 volume of gas and about 5 to 12 volumes of air according to a pressure of from four to seven atmospheres, without any previous compression of the mixture. For this reason, it has hitherto always been necessary to keep within these limits in the mixtures of combustible gases and air used in gas engines or motors; and for the same reason comparatively high pressures and high temperatures are required for working, and the motion of the engines can be regulated only within narrow limits.

According to the present method, any desired quantity of gaseous fuel may be rapidly ignited and burnt within a separate room—*i.e.* the combustion chamber of a gas engine or motor as far as there is a sufficiency of air. For this purpose, the method heretofore employed—of igniting the mixture of combustible gas and air only after the whole charge of fuel has been admitted into the combustion chamber—has been entirely abandoned. The combustible gas is ignited during the mechanically effected mixing of it with air—for example, during the introduction of combustible gas into the chamber which has been previously filled with air, or a mixture of air and indifferent gases. The ignition is accomplished

by an igniting device which is in action from the commencement of the entrance of the combustible gas, or which comes into action while the mixing is taking place between the commencement and the termination of the entrance of the gas.

In this manner it is possible to ignite and to burn comparatively small quantities of combustible gas sooner than, according to the method heretofore adopted, they would be so far rarefied by spreading in the combustion chamber that they would become uninflammable—before, for instance, the mixture could contain for 1 volume of illuminating gas more than 14 volumes of air; and also comparatively large quantities of combustible gas can be caused to ignite before the combustible gas has so super-saturated the air that the mixture becomes uninflammable—*i.e.*, before it would, for example, contain, for 1 volume of illuminating gas, less than 4 volumes of air.

The trials made with this method of combustion have demonstrated that quantities of combustible gas which with the quantity of air available for the combustion would constitute a final mixture of 1 volume of illuminating gas and 100 volumes of air, or a final mixture of 1 volume of gas and 1·1 volumes of air, can still be safely and rapidly ignited and burnt so far as there is sufficient air. In this manner final pressures of from 0·1 atmosphere to 14 atmospheres can be rapidly attained without previous compression of the air of combustion.

In order that the combustion and the production of pressure shall take place rapidly (in from the one-hundredth to one-twenty-fifth of a second) for a working stroke with a duration of about one-fifth of a second—corresponding to 150 revolutions per minute—the combustible gas is preferably introduced with over-pressure. Moreover, in order that the ignition shall be effected without fail, and without danger of its being continued backwards to the compression chamber for the combustible gas, against which, according to recent investigations, even the finest sieves or gauze do not afford protection, the entering combustible must not in any case be ignitible or have admixed so much air or other gases that it would be inflammable before its entrance.

The ignition in the cylinder of the motor, or in the combustion chamber set in communication therewith, is effected by a special igniting device arranged within the reach of the entering combustible gas, and which causes the combustion by means of incandescent bodies or electric sparks or by flames. As the mixture of air contained in the combustion chamber before the admission of the combustible gas is not to be ignitible or combustible, the igniting device can be permanently active—the incandescent body can glow continually, the sparks can leap over uninterruptedly, or the flame can always burn. However, the igniting device may, if desired, operate intermittently; but it must then be in action at the commencement of the entrance of the combustible gas, or be set in action during the time between the beginning and the termination of the entrance thereof.

In carrying this invention into practice, the combustible gas under pressure is introduced through an admission-valve arranged when closed o bear upon a suitable seating in the cylinder cover, and which opens at the proper moment to allow a certain quantity of the gas to pass rapidly into the combustion chamber from a supply pipe or chamber. The combustible gas has for this purpose been previously compressed by means of a pump. An over-pressure of from about 0·5 of an atmosphere—*i.e.*, a pressure by one-half greater than the pressure of the air in the cylinder—is, in order to allow the gas to pass rapidly enough into the air, contained in the combustion chamber, and to be there ignited with certainty and regularity.

For the proper distribution of the combustible gas, it is sometimes arranged that the admission opening is in the form of a perforated diaphragm or in the form of a tube provided with perforations. This perforated tube or diaphragm may, however, be entirely dispensed with; or when it is desired to let the combustible gas enter the combustion chamber in the form of a single jet, the tube or diaphragm may be replaced by a plate having an opening at its centre for the purpose. These admission devices afford in every case material protection to the admission valve against the radiating heat, and (according to the size and number of the openings) also against the initial pressure of the explosion.

The ignition of the combustible gas is effected by a platinum wire rendered incandescent by an electric current; the platinum points being arranged in a convenient position relatively to the admission opening, so that the sparks may pass from the wire to the metal of the diaphragm plates or the walls of the combustion chamber.

For igniting by means of a flame, a slide-valve or any other arrangement by which a permanent or intermittent flame can be produced, may be used; it being only necessary that the flame shall ignite within reach of the combustible mixture produced, either at the very commencement of the entrance of combustible gas or during the time between the commencement and termination of the entrance thereof. This holds good also for any other igniting devices to be used. A repetition of the explosion in the compression chamber of the combustible gas during its entrance in the combustion chamber, is not to be feared, even when the ignition takes place immediately at the admission opening without any protecting device; for a primary condition of the whole method is that the entering combustible gas or the mixture of combustible gas is not inflammable by itself.

The point at which the ignition is to take place may be chosen at will. According to the position of the igniting point relatively to the entrance opening, ignition will occur more or less rapidly as the initial pressure is higher or lower. In general longer distances are preferable for the combustion of large quantities of combustible gas, and shorter distances for smaller quantities; so that by a suitable arrangement of the igniting point, a material influence is obtained over the limits of temperature and pressure of the combustion within which the motor is to be worked.

An important requirement of all the igniting devices, however, is that they can ignite at any temperature of the combustion chamber and its walls. Therefore igniting bodies which during the operation are only kept incandescent by the temperature of the combustion or by a compression preceding the combustion in the combustion chamber, are excluded as igniting devices in the sense of the new method, as otherwise, apart from the uncertainty and irregularity of such an ignition, the material advantages of the process could not be attained, of doing work with such small quantities of combustible gas, temperatures, and pressures which could not keep the igniting bodies incandescent after the expansion and the blowing out of the products of combustion, and moreover of rendering the method of combustion applicable also to motors without the previous compression of the air of combustion.

The combustion chamber can be provided either with or without a water or air cooling jacket. Moreover, the combustion chamber can also be surrounded with a non-conductor of heat, so that its walls can remain incandescent according to the mode of operation of the engine or motor.

The space between the perforated diaphragm and the admission opening for the combustible gas to be introduced is to be kept as small as possible. Accordingly, if possible—on the closing part itself, or else on the walls of the admission openings—filling pieces can be arranged; and by reducing this space the inconvenience is obviated that during the period of expansion and explosion of the burnt gases considerable quantities of unburnt gas flow after and burn uneconomically or too late, and that on the other hand burnt gases collect in the space, and render the ignition uncertain and unequal in the next working stroke.

The present method is also capable of a direct reversion; inasmuch as with the same arrangements air or a mixture of air and gas, not combustible in itself, can be forced, by means of pressure exerted thereon and with any desired distribution, into the combustion chamber, which contains combustible gas or a mixture of gas that does not burn of itself, and in which the ignition is effected by means of a device which is within the reach of the nascent combustible mixture, and is in action from the beginning of the mixing, or comes into action during the time between the commencement and the termination of the entrance of air.

Finally, the method of combustion can be carried out in the same manner if on the one hand a combustible gas or a mixture of combustible gas and air which is not inflammable by itself, and on the other hand air or a mixture of air which is not combustible by itself, pass simultaneously but separately into the combustion chamber of a motor and are ignited during the mixing, either when the entrance begins, or during the time between the commencement and termination of the entrance.

The method here patented is applicable to motors of the most varying constructions, with or without compression, and the ignition and combustion can occur at any point of the stroke of the piston, where the mixing of the combustible gas, not inflammable by itself, with air is performed.

APPLICATIONS FOR LETTERS PATENT.

1073.—Stewart, F. J., "Improvements in collapsible shade holders or frames for gas and other lamps." Jan. 21.

1076.—Andrew, H., and Dudley, J. E., "Improvements in connections with stop-cocks for gas, water, &c." Jan. 21.

1210.—Williams, J., "A reverberating cupola furnace and gas, tar, and crude petroleum making apparatus." Jan. 23.

1235.—Charles, P. J., "A combined instrument for use in opening, closing, and lighting gas-lamps of the Wenham class." Jan. 23.

1271.—Simon, H., "Improvements in coke-ovens." Jan. 23.

1294.—Stoner, W., "An improved governor for regulating gas for gas-engines." Jan. 24.

1319.—Rayner, R., "Automatic chromatropes as shades for candles' lamps, gas, and other sources of light." Jan. 24.

1326.—Greenfield, J., "Improvements in the treatment of coal and small coke or breeze in the manufacture of gas and coke." A communication from C. A. d'Assumpcao and E. S. Dias. Jan. 24.

1342.—Wells, C., "Improvements in gas-engines." Jan. 24.

1351.—Young, W. H., "A new revolving gas-light for bakers' ovens." Jan. 25.

1368.—Laycock, J., "Improvements in apparatus for allowing a certain quantity of gas to pass through a meter." Jan. 25.

1415.—Maldant, E. C., "An improved water meter. Jan. 25.

1424.—Hayes, F. C. H., "Improvements in and relating to apparatus for compressing air, gases, or other fluid, and for force pump purposes generally." Jan. 25.

Additional Debenture Stock for the Bristol Water-Works Company.—The Bristol Water-Works Company held an extraordinary meeting last Saturday. The Chairman (Mr. E. Bush) explained that the shareholders were called together for the purpose of sanctioning the raising of two sums of £80,000 in debenture stock. The Directors thought it better to have a large sum, as it could be got out at a cheaper rate than if the issue had been in smaller sums. The money was in respect of past work, and had been borrowed by temporary loans. The proposal was to convert these temporary loans into debenture stock, to be issued at a minimum premium of 105. The new debentures would bear interest at 3½ per cent. He thought, however, that the public would tender more than 105 for the stock. The proposal was agreed to.

A Testimonial for Oil-Lighting from Erith.—The Clerk to the West Cowes Local Board recently addressed the following letter to the Clerk to the Local Board of Erith:—"My Board being desirous of lighting their district with oil, applied to the Defries Company for terms; and they referred us to Erith, where they said their lamps were in use and gave the greatest satisfaction. Will you oblige my Board by informing me if this is so; and as to the cost and illuminating power of the lamps." "Now this" (says a local correspondent) "is rather an objectionable matter for the Erith Board to be consulted upon; but the West Cowes Board was evidently not aware of this. After introducing oil-lighting with such a flourish of trumpets, and assuring their constituents that, by adopting the artificial light of other days, they would recover for themselves a maximum of comfort with a minimum of expense, the Erith Board could not very well turn round on their glowing prophecies, and say (as they truthfully ought) that the oil-lighting amounted to a nuisance; there being no reliability as to the continuity of the flame in the lanterns, nor any safeguard against the spoiling of clothes by oil drippings from leaky reservoirs, without mentioning the stinks caused by defective wicks and inferior oil. The reason the Erith Board could not say this in reply to the West Cowes Board, was because they were aware that these disadvantages were repeatedly pointed out to them before they made their rash departure; consequently they do not mean to confess their mistake, until they find themselves rejected—as some of them certainly will be—at the next election. They therefore steered as close to the wind as they possibly could, and gave the following equivocal testimonial:—'So long as Messrs. Defries keep the lamps alight and properly trimmed, the members of the Board are satisfied.' There are certainly various degrees of satisfaction; and the Erith Board are well aware of this fact."

Correspondence.

[*We are not responsible for the opinions expressed by Correspondents.*]

PUBLIC LIGHTING BY OIL.

SIR,—I thank you for inserting my letter, on "Oil Public Lighting." It got copied into the *Wimbledon Herald;* and the inhabitants of Wimbledon have benefited thus far, that the officials and staff have all been upon the *qui vive*, and all the lanterns and lamps appear to have had an "extra wash and clean and brush up." The Heavens have been propitious also, and the stars in their courses have helped the Local Board Surveyor; and for one week at any rate this winter, we have been able to find our way about in the roads with as much comfort as can reasonably be expected with oil public lamps few and far between.

With reference to the Surveyor's "impeachment" in your last issue, I wrote in good faith, believing that I wrote "the truth, the whole truth, and nothing but the truth." A gentleman of good standing told me even last evening that tenders were received some time since for the electric light and for gas. To put it mildly, Is the Surveyor's memory at fault? or is he trying to throw dust in our eyes? Possibly we may see later on whether he is the personification and embodiment of truth.

Wimbledon, Feb. 2, 1889. R. P. KEYS.

THE GAS ENGINEERING STAFF AT MANCHESTER.

SIR,—This is the last letter I shall trouble you with on this subject. "Lux's" admitted ignorance of the individual to whom he applied the word "attempt," in the manner he did, is an apology for having applied it, as I thought, very offensively.

I served under the Engineer of the Gaythorn Gas-Works, when he was Engineer of the Rochdale Road Gas-Works; so that I have a good knowledge of the person I speak of, and probably a better knowledge of the Manchester Gas-Works than "Lux" appears to have. What I stated in my former letter are facts; and, by a little trouble, "Lux" can substantiate them for himself. All he has to do is to get permission to view the plans of the Rochdale Road Gas-Works, to verify the transformation I say took place between the dates stated; and without any permission he can take a walk as far as Newtown and see the two triple-lift gasholders spoken of. Whatever value the Gas Committee or the Council place upon the services of their servants, will not alter one jot the truth of the assertion made by me; and I am truly sorry to learn that a Gas Committee of the importance of the Manchester Gas Committee, should have been guilty of such a mean act as to advance an Engineer's salary £10—which is paltry indeed. I may tell "Lux" that, in my opinion, the Manchester Corporation have not got a well-paid officer in their gas engineering staff.

The facts in respect to the old servant accepting his present appointment at the salary he did, so far as "Lux" is concerned, are likely to remain "complex." But one fact "Lux" shall know; and it is that the "old servant" is nearer 70 years old than 60, and consequently not so independent as probably "Lux" may be in a position to be.

The Managers of the Manchester Gas-Works are not responsible for the price at which the gas is sold (at least that is the opinion I have formed), as they have nothing whatever to do with it after it leaves the gasholders; and I very much question whether they have any voice in the purchase of the coal or cannel.

Gas is dearer than it ought to be at Manchester; and one step towards making it cheaper would be to make every "tub stand on its own bottom," and not make the gas consumer pay a portion of the rates of his brother ratepayer (who is a non-consumer of gas) by taking so many thousands of pounds yearly from the gas profits for the alleviation of the rates, instead of giving the gas consumers the benefit of it.

Since "Lux" has introduced a quotation from the *City News*, probably he saw it there stated that a gentleman who had filled the office of Chief Magistrate of the city had suggested that, as crime had somewhat decreased, the duties of the police must be lighter, and consequently it was worth considering whether they could not occasionally be told off to flush the sewers. What does "Lux" think of this economical move? If the bulk of the Council is constituted of such economical men, I am sure the ratepayers cannot accuse them of extravagance, whether or not they can of false economy.

I hope "Lux" may soon have gas at a price and quality that will suit him; and I trust he will assist in sending those men to the Council who will reward their servants according to ability and merit.

Jan. 30, 1889. FAIRPLAY.

WATER SUPPLIES AND LEAD-POISONING.

SIR,—The startling and now frequent announcements in the daily papers of lead-poisoning, especially as having recently manifested itself at Bradford and the neighbouring districts, and the consequent anxiety created in the public mind, induce me to encroach upon your valuable space with the following remarks.

Already attention has been directed to the inadvisability of collecting soft peaty surface waters from the high grounds, and conducting them, without previous filtration through a proper oxidizing material, into towns and cities in the valleys for dietetical purposes, more especially when such waters are allowed to pass through lead pipes or are stored in lead-lined cisterns. Such water becomes charged with dissolved organic matter, mostly of vegetable origin. This, in its native rivulets, is kept sweet by the presence of myriads of organisms, mostly *cypridious* and *entomos tracæ*, of various kinds, together with abundance of green plants —notably the *sphagnum*, or bog moss. When such water is separated from these larger forms of living population, as is often done by straining through sand, the organic matter in solution soon begins to decompose, giving rise to, and accompanied by, a new population of a lower type more minute in size and called by the bacteriologist *schizomycetes*.

The products of decomposing peaty matter readily act upon lead; and a water so charged, dissolves considerable quantities of that metal, and often becomes really poisonous, as in the cases recently cited. The physiological action of lead is accumulative and very insidious; and probably many cases of sickness and failing health, put down to other causes, are really due to incipient lead-poisoning.

There are, moreover, grave reasons for doubting the wisdom of drinking peaty waters, unless previously purified. The death-rates indicate that danger is lurking in the practice of importing these waters for public service. For instance, the high death-rate of Plymouth, as compared with Portsmouth, is probably due, at least in part, to the fact that the inhabitants of the former town drink soft peaty waters, and the latter, deep chalk waters. I could instance many towns supplied with peaty water, which have high death-rates. It behoves such places as are now being supplied with peaty water, to so purify it by efficient filtration as to reduce this danger to a minimum. Mere sand filter-beds *will not* remove either dissolved peat or dissolved lead from water. There is, however, a material recently introduced and known as "Polarite," which effectually deals with these two forms of deleterious dissolved matter. This substance acts, so far as the removal of organic matter is concerned, by virtue of the oxygen which becomes condensed within the material, and is renewed from the air and from the oxygen naturally dissolved in all drinking waters. Consequently, it acts only as a carrier, bringing oxygen into immediate contact with the peaty infusion, and absolutely burning it up. Lead also is absolutely removed by this "Polarite." The existence of the material, therefore, cannot be too widely known in all places where soft peaty waters are supplied. "Polarite" (or magnetic spongy carbon) has, I believe, lately been selected by the Government as the most powerful filtering medium known; and it is sufficiently cheap to be used in all filter-beds.

In concluding these remarks, I would point out to your numerous readers, the vital necessity of purifying water before using it for dietetical purposes—a precaution which, if neglected, must inevitably bring about fatal results.

Victoria Street, S.W., Jan. 28, 1889. GEORGE A. HALL, A.R.I.B.A.

AN ELECTRIC LIGHTING PROJECT FOR WOLVERHAMPTON.—A Company is being formed for the purpose of supplying the inhabitants of Wolverhampton with electricity. The gentlemen who are promoting the scheme, it is said, hold positions of considerable influence in the town and district. It is understood that the necessary plant will be supplied by Messrs. Elwell-Parker, whose large establishment for the manufacture of electrical appliances the members of the Midland Association of Gas Managers had the pleasure of visiting on the occasion of their meeting at Wolverhampton in April, 1886.

THE LIVERPOOL CORPORATION WATCH COMMITTEE AND ELECTRIC LIGHTING.—Last Tuesday, a deputation representing the Liverpool Electric Supply Company, waited upon the Watch Committee of the City Council, and endeavoured to procure their assent to the Provisional Order which the Company intend to seek during the forthcoming session of Parliament. This consent has hitherto been withheld, as the Committee have failed to induce the Company to agree to conditions which are deemed to be essential in the interests of the public. The object of Tuesday's interview was to endeavour to arrange terms which might be mutually satisfactory; but in spite of an unusually protracted consultation, it was found impossible to arrive at an agreement. The practical result, therefore, is that the Watch Committee will refuse their assent to the Company's application.

PROPOSED ABOLITION OF THE DEPOSIT SYSTEM AT BOLTON.—A meeting of the Gas Committee of the Bolton Corporation was held on Friday, when the question of deposits came up for consideration. After some discussion, the following resolution was passed:—"That the system of requiring deposits from consumers be discontinued except in the following cases: 1, casual and temporary customers, as at fair times; 2, notoriously bad payers; 3, persons giving bills of sale, or with whom loss has been sustained by litigation, &c.; 4, strangers to the town taking public-houses, beerhouses, shops, &c.; 5, public-houses and beerhouses where the tenant has been put in by the brewer. The amount of deposit in each of such cases to be equal to the amount of an estimated full winter quarter's consumption of gas; the interest allowed upon such deposits to be at the rate of 4 per cent. per annum. The deposits will be returned when the depositor shall have paid two years' gas accounts with regularity." The deposits in the hands of the Corporation at the present time will be returned to the depositors, in accordance with suggestions of the Office Superintendent, Mr. Walch. They will be paid off gradually.

YORK UNITED GASLIGHT COMPANY.—The report of the Directors of this Company on the working of the concern during the past half year has been issued to the shareholders. It states that the revenue account shows a balance of £7467 6s. to the credit of profit and loss account. This amount, after being charged with £365 12s., the interest upon money borrowed on mortgage, leaves £7101 14s., out of which the Directors recommend the payment of the usual half-year's dividend amounting to £6600, being at the rate of 5s. per share upon the old shares, and 4s. per share, or 5 per cent. per annum, upon the new shares, payable on and after the 12th inst., free of income-tax. The mildness of the winter season has somewhat checked the usual growth of the Company's business; gas consumption only showing an increase upon the corresponding period of 1887 of 2½ per cent. The prices of some of the residuals have been fairly maintained; and this circumstance, coupled with the absence of any exceptional expenses during the half year, accounts largely for the satisfactory financial results. In their last report, the Directors referred to some improvements they had carried out upon the old works. They now add that during the current half year it will be necessary to replace some of the old manufacturing plant to an extent which may somewhat add to the unusually moderate charges in the past half year.

SCARBOROUGH GAS COMPANY.—The report of the Directors of this Company, to be presented at the ordinary half-yearly meeting next Saturday, states that the less revenue on sale of gas during the last six months, consequent upon the reduction (at July) from the net price of 3s. to 2s. 9d. per 1000 cubic feet, has been compensated for to a considerable extent by increased consumption, and the additional revenue derived from residual products. The revenue account shows a profit for the half year of £6685. The net revenue (including £334 brought from last account), after deducting all interest charges for the half year, is £6865. Out of this sum, after providing for the dividend on the 5 per cent. preference stock, the Directors recommend the payment of the maximum dividends upon all other stocks of the Company. The payment of these dividends will absorb £5036, leaving a balance of £1829, from which the Directors recommend that £615 be repaid to the reserve fund (being the amount of the last withdrawal therefrom, which was to meet the deficiency in the half year ending June 30, 1886), and that the remaining £1213 be carried forward to the next half year. For the purpose of meeting additional outlay on capital account, in providing for the steady growth of the Company's business, it will be necessary during the current half year, the Board say, to make a further call of 20 per cent. upon the new stock allotted in 1885.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

SATURDAY, FEB. 2.

(*Before Mr. Justice* KAY.)

In re THE BECK GAS-ENGINE COMPANY.

This was a petition by a contributory for a compulsory winding up of the Company.

Mr. RENSHAW, Q.C., who appeared for the petitioner, said that after the petition had been presented, special meetings of the Company were held, on Jan. 10 and 25, when a resolution was passed and confirmed, providing for a voluntary winding up, and appointing Mr. Roderick Mackay liquidator. There were, however, certain claims which it would be desirable to submit to the Court; and he was willing to take an order for a winding up under the supervision of the Court.

Mr. CHITTY, who appeared for the Company, consented.

The order was accordingly made.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

FRIDAY, JAN. 25.

(*Before Lord Chief Justice* COLERIDGE *and Mr. Justice* HAWKINS.)

WEYMOUTH WATER-WORKS COMPANY *v.* DRAYTON.

This was an appeal from the Weymouth County Court by the defendant, who had been held liable to £5 14s. under the following circumstances:—Defendant being a builder, made application to the Company to put up a stand-pipe for the use of his workmen while erecting two houses. This was done; and the defendant paid for the water so used, and when the houses were finished, he sold them to a third party. After this date, the stand-pipe not having been removed, another builder named Smith used water from it, as the defendant now said, entirely without his knowledge. But it appeared that he had several times promised to pay the account. On this ground, the County Court Judge held that the defendant was liable.

Their LORDSHIPS considered that the evidence, though not conclusive, was sufficient to justify the finding, and dismissed the appeal.

COURT OF SESSION—BILL CHAMBER.—SATURDAY, JAN. 26.

(*Before Lord* WELLWOOD.)

THE PUBLIC LIGHTING OF COATBRIDGE.

In this case the complainers were the Coatbridge Gas Company, and the respondents Mr. J. Motherwell Alston (the Town Clerk) and Mr. J. Jones (the Inspector of Public Lighting), as representing the Town Council. Replying to the statements of complainers, respondents admitted that the Gas-Works Clauses Act, 1871, applies to the Company's undertaking, and that the complainers are thereby bound to supply gas to the public lamps at a price to be fixed by agreement with the Town Council, or, at the option of either party by meter, and that the average indications of all the meters shall be deemed to be the amount consumed by each lamp; also that the complainers supplied the public lamps up to Dec. 31, 1888, at so much per lamp, as fixed by agreement, and that, after Jan. 1, it was to be paid according to the average price, and that the Council had taken the whole charge for lighting and extinguishing the public lamps into their own hands. The complainers had averred that there are about 450 public lamps in the burgh, to 7 of which meters are affixed; and in order that the meters may indicate a fair average, the metered lamps should be lighted and extinguished simultaneously, so far as may be, with the unmetered lamps, and that it is the duty of the respondents to do this. They further said that they had no means at present, except the seven metered lamps, of ascertaining the amount of gas consumed by the public lamps. To this the respondents replied that the meters were affixed by complainers about eighteen months ago, and before the town took over the lighting; and in order to allow these meters to give a fair average, they ought to be extinguished in regular course with the other lamps. On the averment that the respondents had been extinguishing the metered lamps at an earlier hour in the night than the unmetered lamps (particular instances being condescended upon), the Council replied that when the town took over the lighting, they also took into their service the lighting staff, which the complainers had formerly employed, and of whom Jones, the inspector, was one. Jones was asked by the respondents to take charge of the lighting, and was instructed to continue the same course of lighting and extinguishing the lamps as had been followed by the complainers, and which was such as to make the metered lamps indicate the fair average consumption of gas by the whole lamps. Jones and the rest of the lighting staff had, the respondents believed and averred, honestly carried out these instructions, save as after mentioned. The respondents denied that their proceedings were "most wrongful and prejudicial to the complainers." In their statement of facts, the respondents said that, after the town took over the lighting, the authorities had reason to suspect that the metered lamps were being tampered with, so as to make them show the consumption of a greater amount of gas than was in fact burned. All the lamps in the burgh, they said, were extinguished about 11 o'clock at night. After Dec. 31, 1888, the officials of the town found on many occasions that several of the metered lamps, after having been extinguished, had been again turned on, so that the gas was escaping. This having been reported, a watch was set with the following result, *inter alia*:—The street lamp at Bank Street, opposite to Mill Brae, was found to be turned full on, and the gas escaping therefrom, at 1 a.m. on Sunday, Jan. 6, 1889, and again at 3.30 a.m. on Monday, Jan. 7, 1889. On Monday night the lamplighter who attended to this particular lamp was observed to put it out at the right time, but immediately afterwards on the police constable going up to it he found it turned full on, and the gas escaping. The matter was thereupon reported by the respondents to the Fiscal; and complainers, after having learned this, thereafter presented this note of suspension. In conclusion, the respondents quoted from the Gas-Works Clauses Act, 1871, section 27, as follows:—"Any difference which may arise between the undertakers, and any local authority in relation to the supply or consumption of gas to or by such local authority, shall be from time to time settled by arbitration in manner provided by the Companies Clauses Consolidation Act, 1845, with respect to the settlement of disputes by arbitration." The respondents pleaded in law that the complainers' statements were irrelevant, and that the proceedings were excluded by the terms of the 1871 Act.

His LORDSHIP, after hearing Counsel, passed the note for trial of the case; but refused an interim interdict.

HAYLE (CORNWALL) NEW GAS-WORKS.—The works which have been erected for lighting this town, and the neighbourhood of Copperhouse adjoining, have been recently opened successfully. The whole of the engineering plant was erected by Messrs. Willey and Co., of Exeter, and has given the highest satisfaction.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

THE CHIEF GAS EXAMINER'S REPORT FOR THE CITY.

Dr. A. W. Williamson, the Chief Gas Examiner to the Board of Trade, has reported to the Corporation the result of daily testings of the gas supplied to the City of London during the past quarter by The Gaslight and Coke Company. With respect to illuminating power, the average in standard sperm candles was: At the Jewry Street testing-station, 15·9; at King Street, Clothfair, 16·8; and at Dorset Buildings, 16·6. In the two latter cases, the average in illuminating power was above the parliamentary standard (16 candles), while at Jewry Street it was slightly below. The minimum power both at King Street and Dorset Buildings stations was also above the requirements; but at Jewry Street on thirty-three days it has been deficient. The Companies (the report remarks) are not required merely to send out gas of proper quality from the works—which was the excuse made—but it must reach the testing-station in proper quality also, unless some unavoidable cause or accident is proved to have occasioned a deterioration. This regulation is not limited to any particular season or temperature. It applies to a cold winter as much as to a hot summer; although exposure to cold is liable to diminish the illuminating power of gas. If there were no practicable means of protecting the gas from such cooling influence, the Companies would, apparently, be driven to the expediency of immediately improving the quality of the gas which they send out as soon as any serious fall of temperature set in; and their best efforts might be liable to fail in keeping pace with any very sudden fall of temperature. Fortunately, however, means are known, and commonly adopted, for protecting gas-pipes from the action of cold to such an extent as to retard greatly its penetration to the gas which passes through such protected pipes. The lowering of the quality of the gas tested at Jewry Street appears to have been due to the circumstance that the pipe through which the gas passes to the testing-room is not duly protected from external cold. As regards purity, sulphuretted hydrogen has not been present in the gas at any of the testing-stations; and the proportions of sulphur in other forms were considerably less than the limit allowed by the Act, and there was no excess on any occasion during the quarter.

EDINBURGH AND LEITH CORPORATIONS GAS COMMISSION.

PROPOSED IMPROVEMENTS AT THE EDINBURGH WORKS.

Yesterday week, at a Meeting of the Edinburgh and Leith Gas Commission—Lord Provost BOYD presiding—some discussion took place upon the Works Committee's recommendation "that the Commissioners should sanction immediately proceeding with improvements proposed on retorts &c., at the Edinburgh works, to the extent of an outlay of £16,000.

Mr. COLSTON, referring to the recommendation, said it was very necessary that there should be a renewal of the retorts; and the question was whether they should have the old kind of retort, which was now obsolete, or a new form, the introduction of which was expected to effect a saving of about £4000 a year.

Mr. R. MITCHELL, the Engineer of the Edinburgh Works, was requested to read his report on which the Committee's recommendation was based. He calculated the total cost of the structural work would be £9531. The retorts actually at work during the heaviest day last winter in the benches proposed to be removed were 270 small and 20 large ones. The gas produced from these retorts, taking them at their full carbonizing capacity—209 tons of coal on the yearly average of 9820 cubic feet per ton—would be equal to 2,052,380 cubic feet. The total number of retorts available on the site of the proposed retort-house would be 350 small and 44 large. The coal carbonized by these retorts would be 289 tons, which would yield 2,837,980 cubic feet per day. The maximum quantity of gas that would be yielded, provided the new retorts were at work, and all capable of carbonizing their full weight of charges, would be 4,713,600 cubic feet per day; or, if only two-thirds of the works were completed, 3,142,400 cubic feet. The full capacity of the works, provided all the retorts were sound and capable of carbonizing their full weight of charges, would, after the completion of the new retort-bench, be 7,924,700 cubic feet per day; or, for two-thirds of the works, 6,353,500 cubic feet. The estimated number of retorts that would be needed in the new bench for the winter of 1889 would be 300; and the cost of setting these complete was computed at £6584, which, added to the structural cost of £9531, made a total of £16,115 The cost of the proposed retort-house, coal-store, and retort-bench of 40 ovens—320 retorts, being two-thirds of the original proposal—would be £15,401. In submitting the report, Mr. Mitchell stated that if the new scheme were adopted, they could produce more than twice the amount of gas they now did in the same space; that as a matter of fact they were, under the Committee's recommendation, going to have fewer retorts; but that instead of the present retorts, which only carbonize 12½ to 13 cwt. of coal per twenty-four hours, they should have retorts to carbonize from 1 ton to 21 cwt. per twenty-four hours.

Some discussion took place on the financial aspect of the question, during which the point was raised as to whether the expenditure should be taken from capital or revenue.

Mr. C. ROBERTSON observed that the whole scheme would have cost £20,000; but they were going to carry out only two-thirds of it.

After some additional discussion, the recommendation was approved; and the financial part of the question was remitted to the Finance Committee for consideration.

The Finance Committee reported the completion of a final accounting with the Edinburgh Gas Company, by which the latter should hand over to the Commissioners the consumers' deposits amounting to £2163 14s. 6d., on the Commissioners undertaking to repay these to the consumers when required; and that the Commissioners should pay the Company a balance of £4147, after a small reduction for current office books and taxes.

It was also reported that an arrangement had been made with Messrs. J. Ross & Co. to work out with the Commissioners their contracts with the Gas Companies for the purchase of residuals.

A few other minor matters then occupied the attention of the Commissioners.

The scheme which was laid before the Gas Commissioners at the meeting reported above, for the construction of new retorts to meet the increased demand for gas as the city extends, involves (says the *Scotsman*) a certain rearrangement of the New Street works. Within the circumscribed area they occupy, and dealing as the staff has to do daily with so large quantities of material, it was no easy task for the Engineer to provide the necessary space for the new range of retorts required; but careful planning has got over the difficulty. The present retorts are fired on what is known as the open-fire system, with this addition that each furnace is supplied with a current of air, which is heated by passing it under the oven. This heated air is introduced into the furnace at four different points; and by its aid complete combustion of the coke used is

secured. The new retorts, to be built in sets of eight, are to be heated by means of producers; and as each of these supplies gas to two sets of eight retorts, built end on to each other, labour is to a certain extent saved, especially in connection with the stoking of the fires. Each retort is 21 inches by 15 inches respectively in depth and breadth, by 9 feet long, and is capable of carbonizing one ton of coal each day. The new retorts will be built of fire-clay brick of the best quality, with iron mouthpieces. The complete scheme included the construction of 60 ovens with 480 retorts, capable of producing 4,713,600 cubic feet of gas per day. This would have raised the total producing capacity of the works to 7,924,000 cubic feet per day; but as only two-thirds of the scheme is at present to be proceeded with—40 ovens instead of 60—the amount of gas which will be manufactured under the modified plan will be 6,353,000 cubic feet per day. As the demand at present is equal to 4,600,000 cubic feet each day, the quantity even under the modified scheme leaves a considerable margin for contingencies. The project also includes the construction of a high-level railway, 145 yards in length, which will be carried at a height of 10 feet from the ground on iron pillars and malleable iron beams right in front of the new range of retorts. It will join up with the North British railway at the present junction with the gas-works, and will enter the works through what is at present the coke-yard. The existing low-level service railway in this part of the establishment will thereafter be abolished; and the space it now occupies appropriated for the storeage of coal. Upon the line will be a weigh-bridge. The joiners' and smiths' shops will also be moved to the north end of the works. In this "busy hive of industry," there are at present 441 men employed in the various departments of gas-making.

THE FAILURE OF THE GAS SUPPLY AT GLOSSOP.

With respect to the accident at the Glossop Gas-Works which caused a failure in the supply of gas to the town on the evening of the 26th ult., as reported in the JOURNAL last week (p. 209), our readers will have gathered, from the explanation furnished by the Engineer and Manager, Mr. J. Dalgliesh, that the inconvenience caused to the consumers by the deprivation of their light on the busiest evening in the week was entirely due to the defective condition of the purifying plant; the hydraulic centre-valve having not only allowed all the gas as it was made to blow away, but caused the loss of a quantity from the holders through back pressure. Before lighting-up time all seemed in good working order; and with the make going on, there was more than sufficient gas for the requirements of the town. When the valve failed there was enough gas in No. 1 holder for three hours, and No. 2 holder other three hours; but it escaped so quickly that all disappeared in an hour and a half. Everything possible under the circumstances was done by Mr. Dalgliesh and his staff; and, with the determination to prevent a recurrence of the annoyance, they, at great risk, stopped making gas last Thursday, took out the valve, and remedied the defect. It is to be hoped that the entire purifying plant, some of which is getting on for half a century old, will be thoroughly overhauled as soon as circumstances permit, and placed in a condition to satisfactorily meet the requirements of the works. The necessity for this has been pointed out many times by Mr. Dalgliesh during the period of his managership. In the article which appeared last week there are a few inaccuracies which it will now be convenient to put right. In Mr. Dalgliesh's explanatory letter as there given, it was stated that when he found a stoppage in one of the purifiers about eleven o'clock on the morning of the accident, he "at once put on a good gang of men to fill the next vessel (which was not *done* before Sunday), and *charged* it," in the hope of thereby overcoming the difficulty. The two words in italics should have been "due," and "changed"—the purifier in question not being due to be changed before the following Sunday. In the passage quoted from a local paper, it was stated that several of the most important tradesmen had adopted oil, owing to the high price of gas, which was given as 4s. 2d. per 1000 feet subject to a discount of 5d. It appears that only two people in the High Street use oil-lamps (and this as a kind of advertisement), except three who sell oil; and all these burn gas as well. The price stated above is the maximum; the minimum being 3s. 1d., and 3s. 2d. for cooking and heating purposes. With regard to the "inferior quality" of the gas, to which reference was made by the local paper, it may be mentioned that the average illuminating power is 18¼ candles (the Corporation official's tests show more); and if at times the gas has had a disagreeable odour, it must be attributed to the causes to which the accident of the 26th is solely due—the defective condition of the purifiers. Yesterday afternoon we received a telegram from Mr. Dalgliesh to the effect that he had despatched a letter for insertion in to-day's JOURNAL; but up to the time of going to press it had not come to hand.

BRENTFORD GAS COMPANY.

THE DIRECTORS' HALF-YEARLY REPORT AND ACCOUNTS.

The report of the Directors of this Company for the half year ending Dec. 31 last, together with the accounts, has been issued, in view of the general meeting of shareholders to be held next Friday. The accounts show a sum of £69,608 15s. available for division; and the Directors recommend the declaration of dividends at the rate of 5 per cent. per annum on the preference stock, 11¾ per cent. per annum on the consolidated stock, and 8¾ per cent. per annum on the new stock. Allusion is made in the report to the fact that the Directors, in September last, notified to the several Local Authorities in the Company's district a reduction from 2s. 10d. to 2s. 8d. per 1000 cubic feet in the price of gas used in the public lamps, and from 3s. 2d. to 3s. per 1000 cubic feet for that supplied to the private consumers; such reductions to date from the taking of the meter indices for the Christmas quarter of the past year. The report states that the plant is generally in good condition; but provision will have to be made in the course of the coming summer for an increase in the manufacturing and storing capacity of the works, in order to meet the growing demands for gas in the district. The amount received from the sale of gas in the six months covered by the accounts was £79,249, as compared with £74,999 in the corresponding period of 1887; from residuals, £20,180, against £14,878; stove and meter rentals produced £2906, against £2809; and miscellaneous items made up a total of £103,385, against £92,736 at the close of the previous year. The following are the chief items of expenditure compared with those for the second half of 1887:—Manufacture of gas cost £52,572, against £48,702; distribution, £5338, against £7388; rents, rates, and taxes, £2960, against £3624; lighting and repairing public lamps, £1241, against £1238; and management expenses, £3416, against £3400. The total expenditure was £66,381, against £64,914. The balance carried to the profit and loss account is £36,003, against £27,822. The quantity of coal and cannel carbonized was 50,000 tons—an increase of 2374 tons on the amount used in the closing six months of 1887. The following are the comparative working results:—Gas, 528,851,000 cubic feet, against 511,193,000 cubic feet; coke, 33,685 tons, against 31,902 tons; breeze, 4185 tons, against 3775 tons; tar, 511,688 gallons, against 493,998 gallons; ammoniacal liquor, 13,534 butts (of 108 gallons), against 12,641 butts. The public lighting of the Company's district was improved during the past year by the erection of 161 additional lamps. With regard to the Company's financial position, out of the total capital of £1,480,000 authorized (£1,180,000 share and £300,000 loan), £700,211 17s. 4d. had been called up at the end of June last; and this was not added to during the half year covered by the accounts. The expenditure, however, was increased by the small sum of £2584 14s. 7d. (the bulk of which was for additional mains and services); bringing it up to £688,591 1s. 3d., or within £11,620 16s. 1d. of the receipts.

THE GASLIGHT AND COKE COMPANY.

In the last issue of the JOURNAL (p. 209), we published the reports of the Directors and Chief Officials of the above Company for the half year ending Dec. 31, 1888. We now give the accounts for this period; following the plan we have lately adopted of merely indicating the alterations which have taken place in the portions of the accounts which are not subject to much variation, and reproducing the rest in full.

Nos. 1 and 2 are statements of stock, share, and loan capital, the totals of which stand as in the previous account—viz., Stock and share capital, £8,103,000; loan capital, £2,186,000.

No. 3 is the capital account, which has not undergone any change as far as the receipts are concerned; the total being £10,690,900 (comprising the amounts of share and loan capital above-named, and £401,900 of premium capital). The expenditure is shown in the following items:—

Expenditure to June 30, 1888			£10,239,469 9 9
Expenditure during the half year to Dec. 31, 1888, viz.:—			
Lands acquired, including law charges	£6,976 5 6		
Buildings and machinery in extension of works	53,933 4		
New and additional mains and service-pipes	5,857 5 7		
Do. do. meters	6,422 16 3		
Do. do. stoves	3,139 8 10		
	£76,329 0 8		
Less—Depreciation of meters £3,699 0 0			
Do. stoves 1,869 0 0			
	5,568 0 0		
		70,761 0 8	
		£10,310,230 10 5	
Balance of capital account		380,669 9 7	
		£10,690,900 0 0	

Nos. 4 and 5 are the revenue and net revenue accounts. These are given in full on the opposite page.

No. 6 is a statement showing how the Directors propose to appropriate the balance applicable for dividend. It is as follows:—

Dec., 1887.			
£156,961 ..	Net balance brought from last account	£277,562 16 10	
408,269 ..	Net revenue for the half year	382,598 16 10	
			£660,161 13 8
£565,230 ..			
(12¼ per cent.)	A dividend on the ordinary stock—		
334,936 ..	18 per cent. on £5,468,600	—	355,459 0 0
£230,294 ..	Balance carried to next account		£304,702 13 8

Nos. 7 and 8 are the reserve and insurance fund accounts. The former shows that the balance of the reserve fund on June 30 last was £495,252 5s. 1d., which was increased at the close of the past half year to £502,696 2s. 6d., by the addition of £7443 17s. 5d.—interest on the amount invested. The insurance fund stood at £80,115 8s. 6d. at the end of June last; at the close of the year it amounted to £87,319 12s. 2d.

No. 9 is the depreciation fund account. It stood at £32,417 6s. 1d. on June 30 last; and by the end of the year, it had been raised to £33,654 10s. 11d., by the addition of £750 brought from the revenue account, and £487 4s. 10d. received as interest.

Nos. 10 and 11 are as follows; and Nos. 12 and 13 are given on the opposite page

No. 10.—STATEMENT OF COALS USED, ETC.

Description of Coal.	In Store, June 30, 1888.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, Dec. 31, 1888.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common . .	82,897	993,681	864,632	682	211,274
Cannel . . .	37,474	936	15,955	..	22,445
Total . .	120,371	994,617	880,587	682	233,719

No. 11.—STATEMENT OF RESIDUAL PRODUCTS.

Description.	In Store, June 30, 1888.	Made during Half Year.	Used during Half Year.	Sold during Half Year.	In Store, Dec. 31, 1888.
Coke—chaldrons . . .	11,656	546,981	126,509	397,873	34,255
Breeze—chaldrons . . .		42,793	21,943	18,907	1,991
Tar—gallons		9,771,692	8,700,876	849,634	726,626
Ammoniacal liquor—butts	8,977	252,385	234,994	9,658	17,510

REDUCTION IN THE PRICE OF GAS AT HARROW.—A substantial reduction in the price of gas, of 3d. per 1000 cubic feet (to take effect from Lady-day next), is announced by the Directors of the Harrow Gas Company. It is to be hoped that this concession will induce a larger number of residents in the district to use gas for lighting and heating purposes.

THE HALIFAX GAS SCANDAL.—"Fair Play," writing to the *Halifax Courier*, suggests that it is time the ratepayers were enlightened as to what is being done, or is in contemplation by the Committee appointed to investigate the gas scandal. This delay and hesitancy in dealing with so grave a charge against the late Manager and others recently connected with the department, is, the writer says, "a serious matter in a social as well as a pecuniary sense to Mr. Carr, and unworthy so important a body as the Halifax Corporation, after the positive assurances given by the Mayor that he 'could a tale unfold.' The position assumed by the Committee ought not to be tolerated a moment longer; and I for one enter my protest against it. If the ratepayers have been defrauded, reparation should be insisted upon, or punishment inflicted. On the other hand, if the charges cannot be substantiated, it is cowardly in the extreme for a powerful body, such as the Halifax Corporation, to blast the reputation of an innocent man, and then assume the defensive and require him to prosecute them in order to vindicate his character. If the majority of the Council have erred in being over-zealous in the ratepayers' interests in this matter, let them admit it. The public will not fall into a similar error in judging them, but will hold the balance fairly and see that justice is done. The charges brought against Mr. Carr brand him as a scoundrel if guilty, or a much maligned man if innocent. Which is he, and how are we to have this matter settled? Surely, Mr. Editor, Yorkshiremen will not allow it to rest here."

ACCOUNTS OF THE GASLIGHT AND COKE COMPANY FOR THE HALF YEAR ENDING DEC. 31, 1888.

No. 4.—REVENUE ACCOUNT.

Dr. Cr.

Dec. Half Year, 1887.	To Manufacture of gas—	£ s. d.	£ s. d.	Dec. Half Year, 1887.	By Sale of gas—	£ s. d.	£ s. d.
	Coals, including dues, carriage, unloading and trimming (see			£1,115,083	Common gas, per meter, at 2s. 9d. and 2s. 5d. per 1000 cubic feet. .	1,067,656 7 4	
£518,481	Account No. 10)	540,133 0 9			Cannel gas, per meter, at 3s. 5d.		
	Salaries of Engineers and other			46,132	per 1000 cubic feet	42,806 3 11	
9,919	Officers at works	9,924 1 10			Public lighting and under contracts—		
114,194	Wages (carbonizing)	119,450 3 3		69,505	Common gas	65,197 12 6	
	Purification, including £14,713 0s.			2,730	Cannel gas	2,588 5 4	
26,449	1d. for labour	25,297 3 8			(See Statement No. 12.)		1,178,303 9 1
	Repair and maintenance of works and plant, materials and labour,			£1,233,450			
	less received for old materials,			25,310	Rental of meters	..	25,708 1 4
108,912	£1280 10s. 1d.	126,849 11 6		2,097	Rental of stoves	..	2,501 16 11
			821,654 1 0		Residual products—		
	Distribution of gas—				Coke, less £28,172 0s. 3d. for		
	Salaries and wages of Officers			182,090	labour, &c.	211,847 15 4	
23,461	(including Rental Clerks) . .	22,983 0 2		6,859	Breeze, less £1378 2s. 3d. for ditto	5,922 16 9	
	Repair and maintenance of mains			38,282	Tar and tar products	69,375 12 6	
24,655	and service-pipes	21,856 9 9			Ammoniacal liquor and sulphate		
15,389	Repair and renewals of meters .	13,857 18 8		70,273	of ammonia	74,757 16 6	
3,664	Repair and renewals of stoves . .	4,210 16 3					361,404 1 1
	Public lamps—		62,858 4 10	3,598	Rents receivable		3,454 6 1
15,100	Lighting and repairing	15,097 8 3		183	Transfer fees		187 2 6
..	Experimental Street Lighting. .	375 6 10		300	Canteen account		300 0 0
			15,472 15 1				
	Rents, rates, and taxes—						
3,506	Rents payable	3,466 7 9					
71,741	Rates and taxes	76,076 6 2					
			79,542 13 11				
	Management—						
2,750	Directors' allowance	2,750 0 0					
200	Company's Auditors	200 0 0					
	Salaries of Secretary, Accountant,						
7,005	and Clerks	7,356 14 4					
14,491	Collectors' commission	14,562 16 3					
3,216	Stationery and printing	3,540 19 5					
1,918	General charges	1,340 9 4					
			29,750 19 4				
87	Parliamentary charges	..	23 7 8				
3,422	Law charges	..	478 10 9				
7,506	Bad debts	..	6,672 7 5				
	Depreciation fund, for works on lease-						
750	hold land	..	750 0 0				
13,143	Annuities	..	8,645 11 11				
	Public Officers—						
1,510	Gas Referees and Official Auditor.	846 1 2					
530	Public testing-stations	1,202 12 9	2,048 18 11				
£991,682			1,027,897 5 10				
570,760	Balance carried to net revenue account, No. 5 .		543,961 11 2				
£1,562,442			1,571,858 17 0	£1,562,442			1,571,858 17 0

No. 5.—NET REVENUE ACCOUNT.

Dr. Cr.

Dec. Half Year, 1887.		£ s. d.	£ s. d.	Dec. Half Year, 1887.		£ s. d.	£ s. d.
£54,920	To interest on debenture stocks and bonds, accrued to Dec. 31, 1888 . .	..	54,919 12 6	£491,885	By Balance from last account	688,021 16 10	
					Less dividend on the ordinary capital		
59,816	Dividend on the preference stocks . .	59,810 0 0		334,924	for the half year to June 30, 1888 .	355,459 0 0	
47,500	Dividend on the maximum stocks . .	47,500 0 0					277,562 16 10
			107,310 0 0	£156,961			
255	Interest on temporary loans and sundry funds . . .	..		..	Net amount of Interest on Money on Deposit . . .		866 18 2
565,230	Balance applicable to dividend on the ordinary stock .	660,161 13 8		570,760	Revenue account (No. 4)		543,961 11 2
£727,721			822,391 6 2	£727,721			822,391 6 2

No. 12.—STATEMENT OF GAS MADE, SOLD, Etc.

Description of Gas.	Quantity Made.	Quantity Sold.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	8,884,047	461,540	7,850,038	8,311,578	97,576	8,409,154	474,893	46,256
Cannel.	288,451	15,812	252,731	268,543	2,063	270,606	17,845	2,186
Total.	9,172,498	477,352	8,102,769	8,580,121	99,639	8,679,760	492,738	48,442
December half year, 1887 .	8,847,577	465,119	7,781,082	8,246,201	97,867	8,344,068	503,509	47,800

No. 13.—GENERAL BALANCE-SHEET.

Dr. Cr.

Dec. Half Year 1887.		£ s. d.	£ s. d.	Dec. Half Year 1887.		£ s. d.	£ s. d.
£	To Capital—			£			
454,575	Balance at credit thereof	..	380,609 9 7	51,717	By Cash at Bankers.	..	52,864 10 3
	Net Revenue—						
565,230	Balance at credit thereof	..	660,161 13 8	..	Amount on deposit at interest . . .	..	175,000 0 0
	Reserve Fund—				Amount invested— Stock.		
486,789	Balance at credit thereof	502,696 2 6			2½ per Ct. Consoli-		
	Insurance Fund—			596,085	dated Stock . . £632,883 16 10	..	617,670 5 7
78,092	Balance at credit thereof	81,319 12 2					
	Depreciation Fund—				Stores on hand, viz.—		
31,204	Balance at credit thereof	33,654 10 11		167,406	Coals	147,687 3 2	
			617,670 5 7	7,999	Coke	17,047 17 5	
	Interest on debenture stocks and bonds,				Tar and ammoniacal liquor and		
..	due on Dec. 31, 1888	..	54,919 12 6	45,299	products	56,987 6 1	
	Preference and maximum dividends			121,272	Sundry stores	122,219 13 6	
107,316	due on Dec. 31, 1888	..	107,310 0 0				343,892 0 2
	Unclaimed dividends due on Dec. 30,				Accounts due to the Company, viz.—		
10,915	1888	..	10,915 3 2		Gas and meter rental—		
	Sundry tradesmen and others, for			870,113	Quarter ending Dec. 31, 1888 . .	802,752 4 3	
	amount due for coals, stores, and			13,981	Arrears outstanding	14,991 13 8	
198,988	sundries.	..	219,256 12 9				817,143 17 11
1,667	Benevolent Fund	..	1,667 6 8				
				42,600	Coke and other residual products .	45,225 14 8	
				18,249	Sundry accounts	773 15 4	
							45,999 10 0
1,934,721			2,052,570 3 11	1,934,721			2,052,570 3 11

THE PRICE OF GAS AT MANCHESTER.

Writing on that perennial subject of discussion in the Manchester papers—the smoke nuisance—a Mr. William Thomson, in the *Manchester Guardian* of the 2nd inst., makes the following suggestion:—That the Gas Committee might materially reduce the smoke nuisance, and improve the health of Manchester, if they could reduce the price of gas to consumers to a point where it would pay to burn it instead of coal for cooking and heating purposes. It is difficult, he says, to understand why Manchester should be so far behind any town in England in this respect. Take, for example, Plymouth. This town is supplied with gas by a private Company at a cost to the consumers of 1s. 9d. per 1000 cubic feet; and out of this the Company declares the handsome profit of 12½ per cent. on the original capital, and 9¾ per cent. on the additional capital, and this exclusive of £1000 per annum for Directors' allowances. It would be interesting, observes the writer, to know how the Plymouth Company produces such results, because, when compared with Manchester, they seem to be handicapped in every direction. Thus, the average cost of coal delivered at the Manchester Gas-Works is about 12s. per ton; whilst delivered at the Plymouth works, it is about 13s. per ton. Manchester is a much larger town than Plymouth, and as the cost of production decreases as the quantity manufactured increases, Manchester should thus have a great advantage over Plymouth, and should presumably be able to sell gas at 1s. 9d. per 1000 feet, and declare a still larger profit than the Plymouth Company. Assuming, however, that the conditions are equal, why, Mr. Thomson asks, this difference between 32d. in Manchester and 21d. in Plymouth per 1000 cubic feet used? If 21d. is a proper price to pay for gas, there is a tax put on Manchester gas of upwards of 52 per cent. on the Plymouth gas basis. The letter continues: "It might, of course, be argued that as this tax or profit is expended by the Improvement or other Committee, the public obtain the benefit; and that it is a convenient way of paying taxes. The point, however, is, that the people who endeavour to reduce the smoke nuisance by burning gas instead of coal are taxed or, as it were, fined by the Corporation for so doing; whilst those who burn oil, and pollute the atmosphere with coal smoke, are entirely exempted from the tax. Would it not be better to remove the tax from gas, and add it to the ordinary taxes to the required amount, so that all householders should be taxed *pro ratâ* on their rentals; so that the Corporation may offer every inducement to the people to burn gas instead of coal, and thus aid in reducing the smoke nuisance? If the price of gas were reduced, the quantity required would be increased; and as the Corporation are in possession of a gas-works which I understand is seldom used, it might economically be employed in producing gas at the lowest cost."

THE PROPOSED SCHEME OF ELECTRIC LIGHTING FOR BIRMINGHAM.

After much deliberation, the General Purposes Committee of the Birmingham Corporation have determined to advise the Corporation to withhold their consent to the Provisional Order applied for by Messrs. Chamberlain and Hookham to empower them to supply electricity in the city; and they are also of opinion that it is not at present desirable for the Corporation, as the local authority, to acquire the power to supply electricity. The Committee have carefully considered the report on this subject presented to the Council in 1882; and, in their judgment, many, if not all, of the reasons which induced the Council at that time to leave the question of electric lighting to private enterprise, are still in force. They think, therefore, that it would be unwise in the present state of electrical science to embark the money of the ratepayers in the establishment of an electrical installation. In connection with this subject, they have considered a proposal made to them on behalf of the promoters of the present Provisional Order, to sell to the Council their undertaking within a period of two years from the date of the Order being obtained; and they have come to the conclusion that there is nothing in this offer that would induce them to recommend the Council to avail themselvs of it, inasmuch as, in their opinion, if ever the lighting of the city by electricity is undertaken by the local authority, it would have to be done on a totally different scale to that contemplated by Messrs. Chamberlain and Hookham. On this subject, as also on that of the Provisional Order, the Committee have consulted Mr. Henry Lee, M. Inst. M.E. Mr. Lea points out that an erroneous opinion appears to be prevalent that, in order to light a large town by electricity, it would be advisable to establish throughout the town a number of separate stations at short distances apart. Such a measure appears to him to be surrounded with difficulties and objections, of which he points out several. The Committee have also considered the question of overhead wires. These, the Committee are advised, are a source of danger and inconvenience, and should not be allowed. As far as any attachments have been made to corporate property, the Committee recommend that they should be discontinued; but the state of the law does not at present permit the local authority to interfere where the wires are attached to property not belonging to the Corporation. At the same time they would not be prepared to approve of any Electric Lighting Order in which overhead wires were contemplated. With regard to the Provisional Order that has been applied for by Messrs. Chamberlain and Hookham, the Committee regret that, after the expenditure of a very considerable amount of time and trouble, they have not been able to come to an agreement with the promoters. The Order as ultimately submitted contained two areas—Schedule A, comprising the principal business streets of the city; and Schedule B, containing the whole of the city area, for purposes of extension. The Committee are informed that the Board of Trade would not be likely to sanction so large an area as the whole of the city, even in the event of an Order promoted by the Corporation itself; and therefore, after careful consideration, they determined to limit the promoters to the area comprised in Schedule A. The next important question was that of capital. Hitherto, as far as the Committee are aware no Electric Lighting Order for the supply of a large city has been obtained by individuals; and the rules of the Board of Trade do not seem to provide for such a state of things. They provide, however, that where the undertakers are a company as distinguished from the local authority, that suitable capital shall be set aside for the purpose of the undertaking. It was argued on the part of Messrs. Chamberlain and Hookham, in the first instance, that, as they were individuals and not a company, it would not be necessary to make provisions of this kind. The Committee, however, could not adopt this view of the situation; and ultimately came to the conclusion that Messrs. Chamberlain and Hookham ought to form a Company, with properly subscribed capital, before commencing any works. The amount of capital was then the subject of considerable discussion. The Committee were advised that for Schedule A alone £100,000 is the lowest sum that would be required to give a sufficient supply of electricity within the area. To this the promoters demurred; and it soon became evident that they were not prepared to undertake the expenditure of anything approaching that amount. On this subject the Committee may observe that all through the negotiations there has appeared to them to have been a misunderstanding between themselves and the promoters; the Committee contending on the one hand that, in the interests of the public, it was their duty to see that an Electric Lighting Order was not granted over any area without adequate provisions being made for the sufficiency of the general supply. The promoters, on the other hand—basing their calculations on their preliminary canvass—only contemplate a supply to a limited number of persons within that area. This contention appeared to the Committee to be contrary to the spirit of the Electric Lighting Acts, 1882 and 1888, and to the express provisions of the Provisional Orders that have hitherto been granted by the Board of Trade. On the question of deposit, also, the Committee and promoters were considerably at issue. Numerous other alterations appeared to the Committee necessary in the Provisional Order as submitted by the undertakers. At the latest interview, which took place on the 17th ult., the Committee made a further effort to meet the promoters' views; and correspondence ensued between the Town Clerk and Messrs. Smith, Pinsent, and Co., the Solicitors to Messrs. Chamberlain and Hookham. At a meeting of the Sub-Committee on the 28th, Mr. Pinsent, on behalf of the promoters, insisted on having the whole of the area of the city included in Schedule B, and quoted the Chelsea Order as a precedent in this respect. He offered, in the event of this being conceded, to increase the capital to the amount required by the Committee for Schedule A. The Committee state that it is now quite clear that if the promoters adhere to their requirement of a concession over the whole of the city, the consent of the Corporation cannot be given to the Provisional Order in time for an application to Parliament by the Board of Trade this year; and while the Committee regret that they have been unable to come to terms with the promoters, they feel that on both sides a considerable amount of information has been obtained. The Committee are anxious that an installation of electric lighting should take place in Birmingham; but they are of opinion that it ought not to be looked at merely in the interests of the undertakers, but also from the point of view of the public, who are to be consumers. It is perfectly true, they say, that the Electric Lighting Act, 1888, does not make the grant of a Provisional Order a legal monopoly; but if an Order is granted over a certain area, it very materially lessens the chance of any future application to light the same area by another company. It, therefore, seemed to the Committee to be their duty to insist upon the same clauses that have been given by other companies; and, indeed, several of the clauses required by the Corporation were taken from the experience of the Compressed Air Power Company, and which were inserted by them in their Act of Parliament.

THE BREAKING UP OF PUBLIC STREETS FOR ELECTRIC LIGHTING WIRES.

A circular, of which the following is a copy, has been addressed by the Board of Trade to various local authorities, in whose districts roads have been broken up for the purpose of laying down mains for electric lighting purposes:—

"*Board of Trade, Jan.* 29, 1889.

Sir,—I am desired by the Board of Trade to state for the information of the Vestry, that their attention has been called to the fact that certain streets in the parish of have been, and are being broken up with a view to the laying of mains for the supply of electricity by persons having no statutory powers under the Electric Lighting Acts, 1882 and 1888.

The Board of Trade have been advised that no member of the public (and a company not possessing statutory powers would be in the position of a member of the public) can, either with or without the assent of the local authorities, interfere with public highways in such a way as to cause obstruction to the public, even though such obstruction were limited to the time during which they were executing their work.

It is, in the opinion of the Board of Trade, very undesirable that mains for the supply of electricity should be laid down in any street being a public highway by persons possessing no parliamentary powers.

The applications for statutory powers now before the Board of Trade show that there is considerable competition in the Metropolis for the privilege of supplying electricity; and the difficulty of dealing with these applications in the general interest of the public will be materially increased if individuals or companies have laid mains without statutory powers, and, consequently, without the obligations which the Legislature has imposed for the protection of the interests of the public.

It must also be remembered that the financial interests of electric undertakings which occupy streets with their mains, and supply electricity to the public, without statutory powers are by no means secured, in the same way, and to the same extent, as if they possessed those powers; since, in the first place, their works run the risk of being stopped by the direction of a Court of Law, at the instance either of some public authority, or of any one who may at any time, now or hereafter, feel himself aggrieved; and since, in the next place, they do not possess the remedies for enforcing against their customers their charges, which the Legislature has given to those who obtain statutory powers.

The status of applicants to the Board of Trade, and through them to Parliament, should be such as to ensure perfect equality to all; and there is danger that this might not be the case if any persons, either being or about to be applicants for statutory powers, were in the actual occupation of streets.

It has become, therefore, necessary to consider the action which may have to be taken in view of the facts above referred to; and I am desired to request the early observations of the Vestry upon the points mentioned.—I am, Sir, your obedient servant,

HENRY G. CALCRAFT

THE PROPOSED ELECTRIC LIGHTING OF DUBLIN.

A Special Meeting of the Municipal Council of Dublin was held yesterday week—the Right Hon. the LORD MAYOR presiding—"to consider and do, or cause or direct all necessary acts to be done, upon or in relation to the after-mentioned business—namely, to consider, and, if deemed expedient, to adopt a resolution authorizing an application by the Corporation, as Local Authority for the city of Dublin, to the Board of Trade, for a Licence to authorize the Corporation to supply electricity for any public or private purposes within the area of the city of Dublin."

Mr. ROBINSON said he wished to move that the intent of the notice convening the meeting be given effect to, and that the Corporation should apply for a Licence authorizing them to supply electricity for private as well as public purposes. It would be within the recollection of the members of the Council that six or eight months ago they determined on obtaining a Provisional Order for the purposes for which they now asked the Council to apply for a Licence. Their reason for applying for a Provisional Order was because the Gas Company had served them with notice that it was their intention to do so. In order that they might obtain the entire privilege of lighting the city with electricity, they were bound to apply for an Order also; and if the Gas Company had persevered with their application, they should have done the same. However, the necessary plans were not lodged at the proper date by the Gas Company;

and at the meeting on Dec. 18, he proposed a resolution to proceed for a Licence in place of an Order. He wrote to the different persons who tendered for the supply of electricity for public purposes; and they all agreed in stating that, if they had power to supply electricity for private purposes, their charge for public lighting would be considerably less than otherwise. He had also sent out a little circular to some of the leading merchants on the line of route that they proposed to light with electricity; and he received favourable replies from a large number who resided between the Rotunda and Stephen's Green. He saw that in other cities they were adopting electricity. In Paris they proposed to light the Avenue de l'Opera and several of the large boulevards; and in Berlin there had been an extensive use of electricity. In America a great many towns were using electricity; but San Francisco was still lighted by gas. In a paper which a gentleman had sent them from that city, there was an article on the state of the lighting which in every line applied to Dublin. It was as follows:—"The steady progress of improvement in the art of electric lighting is watched in San Francisco with anxious interest. The people of this city are rapidly attaining a state of mind in which they will welcome electricity, magnesium, kerosene, whale oil, wax candles, tallow dips, pine knots, luminous paint, fireflies, dead fish, or anything else that may promise to emancipate them from gas. San Francisco gas is peculiar. Its luminous power is all concentrated in one spot—the Gas Inspector's office. There it shines always with a pure 18-candle power radiance; but elsewhere its abilities are limited to turning the meter and asphyxiating the stranger who blows it out. Some time ago, when the debility of the gas supply was attracting general attention, we were told that the trouble was due to a lack of Australian shale. This deficiency made it necessary for the public to burn more gas, and consequently to pay higher bills for the same amount of light; but the collectors informed us that the Company was bearing the misfortune with patient fortitude, and the people were shamed into doing the same. But how is it now? Is there a chronic scarcity of Australian shale? The shale certainly cannot be any scarcer than the light. The Mayor and Board of Supervisors will have numerous opportunities to distinguish themselves during the next two years; and in no way more markedly than by bringing the insolent gas and water monopolies to terms. The Gas Company has full possession of the streets. In the nature of things, there can be no effective competition with it, at least until a system of independent private-house plant for electric lighting has been developed. It is the duty of the city government to keep the monopoly in order, not only in the matter of rates, but of quality. Every man's eye is a good enough photometer to tell him that the present service is an imposition." He (Mr. Robinson) thought that was very much the state of affairs that now existed in Dublin. He begged to move—"That the necessary steps be taken to obtain a Licence to authorize the Corporation to supply electricity for any public or private purpose within the area of the city of Dublin."

The Lord Mayor remarked that the Licence had already been obtained for public purposes.

The Town Clerk said it was proposed to repeal the present Licence by the new one as soon as it comes into operation.

The Lord Mayor observed that he had written to Mr. Courtney Boyle, who had control over this matter, with reference to the Licence, and he said: "The Licence is in its last stage of revision, and has been sent to your agents and other parties interested for any final observations preparatory to issue." He thought they might confine the present motion to a matter with which that Licence did not deal.

The resolution was amended so as only to deal with private lighting.

Alderman Mulligan, in seconding the resolution, said many English towns were using electric lighting, and Dublin should not be behind any of them.

Mr. Dawson asked the result of the experiment by the Waterford Corporation in lighting the city by electricity.

Mr. Robinson replied that the Gas Inspector had written to Waterford, and had received a letter stating that the system of lighting there had given the utmost satisfaction; and they found it cheaper than gas.

Mr. Dennehy opposed the motion, and appealed to the fact that the Leamington Town Council had determined to discontinue the use of electricity, as a proof that it was an unwise experiment. He did not think that they were doing a proper, wise, or popular act in encouraging this motion.

On a division 37 voted for the motion; and only Mr. Dennehy opposed it.

York New Water-Works Company.—The Directors of this Company report that there has been a diminution in the revenue from water-rents during the past half year, as compared with the corresponding period of last year. This, they say, arises mainly from decreased receipts on meter accounts, and is due in a great measure to the reduced quantity of water taken for military purposes. It is, however, satisfactory to note that the diminution has been more than met by the decrease in the working expenses. The Directors recommend that dividends at the rate of 5 per cent. per annum, 9 per cent., and £6 6s. per cent., be paid on the preference, ordinary, and new shares respectively for the half year.

The Use of Oil-Lamps for the Public Lighting of Wimbledon and Erith.—The *Wimbledon Herald* having copied the letter from Mr. Keys which appeared in our "Correspondence" columns on the 22nd ult., that gentleman has forwarded to our contemporary the following further communication on the subject, which may also be taken as a reply to the letter of Mr. W. Santo Crimp which we published last week:—"If my letter to the Journal of Gas Lighting had been written solely for the good folks of Wimbledon only, I certainly would not have mixed up the two systems of oil public lighting in one letter—viz., the antiquated post deluvian system in vogue at Wimbledon with the new 'fangled-dangled' system adopted with sorrow by the Erith Local Board. In my opinion, both systems are bad when gas can be obtained at a fair market price; and most certainly I don't hesitate to assert from the exhibition that I have witnessed the last six months during this exceptionally foggy weather public oil-lamps have been a miserable failure. It has been very foggy; at times very windy and frosty also. Fog, wind, and frost are the three things that test oil-lamps in the open air; and I repeat again that if, after six years' experimenting, the exhibition I have witnessed is the best the local Surveyor can show in the nineteenth century, then bad has been his best during this foggy weather, and oil-lamps are doomed in the long run. If asked to make oath upon this question as to the last six months, I do not think the Local Board Surveyor would swear before God and his fellow-men that the oil-lighting at Wimbledon has been superior, or equal to, the gas-lamps of the adjoining parishes of Merton, Tooting, and Wandsworth. I accept the Local Board Surveyor's statement that, officially, tenders have not yet been received; but it is equally true that prices have been obtained, and freely quoted, by some of the leading men during the recent election contest. One thing I suppose the Surveyor will not deny me; that is, the right of private judgment—an opinion of my own. I exercised it before he was born; have exercised it very freely since; and should be sorry to be deprived of the privilege."

LIVERPOOL CORPORATION WATER SUPPLY.

Proposed Increase of Charges—Expenditure on the Vyrnwy Works.

The Water Committee of the Liverpool Corporation, it is reported, find themselves at the present moment in a financial difficulty. Latterly, owing to the general fall in the value of property, both in and around Liverpool, assessments have of necessity been reduced. The natural result has been that the water-rate for Liverpool and the surrounding district over which the Water Committee have jurisdiction, has yielded considerably less than it produced, for example, in 1886 and 1887. The decrease, in fact, has been serious, averaging over the whole district, it is said, about 20 per cent.; and the Committee find themselves in consequence with a reduced income just at the time when their obligations in regard to the Vyrnwy outlay render all their resources necessary. The Committee have therefore come to a conclusion to ask the Council, at their next meeting, in view of the necessities of the case, to increase the water-rate from the present uniform 6d. in the pound to 7½d. in the pound for the city, and 10d. in the out-townships. Referring to this proposal, the *Liverpool Courier* remarks: Whether it will meet with approval remains to be seen. So many charges of extravagance have been levelled at the Committee, that, even where such charges have altogether failed, they have left behind some feeling on the matter. It is, nevertheless, needless to speculate on the probabilities. What may be pointed out is that the water-rate produced in 1887 £68,607 11s. 7d.; last year it produced 20 per cent. less than that. The ordinary yearly income of the Water Committee, presuming that no such decrease had occurred, would be, judging from previous years, about £227,000; and the total ordinary outlay (which does not include the Vyrnwy works) about £225,000, embracing interest on loans amounting to about £145,000, and charges for the repair and maintenance of existing pumping stations, reservoirs, and works, stores, salaries, &c., which come to about £70,000 a year. From this it will be seen that the balance to credit is a small one, and that if the income of the Committee is reduced by £15,000 or £18,000, an increase of rates becomes a necessity.

The Committee have just published the quarterly statement of expenditure on the Vyrnwy works. From this report it appears that during the three months ending Dec. 31, 1888, there was expended on the embankment and on works connected with the great reservoir £14,891—a total for this section of the scheme of £508,374. The quarrying operations at Llanwddyn cost during the same period £3396—making a total for this purpose of £185,936. On the pipe-line the quarter's expenditure was £34,534—bringing the total to date of report to £884,394. On the purchase of land and easements there was expended £3377, making the whole cost of land, &c., £277,860, and bringing up the total cost of construction to date to £1,856,566. In addition to this, £12,898 has been spent on the maintenance of the Vyrnwy estate, including repairs and additions to farm buildings and cottages. This makes the grand total of expenditure £1,869,465.

LEICESTER CORPORATION WATER UNDERTAKING.

Proposed Additional Source of Supply.

At the Meeting of the Leicester Town Council last Tuesday—the Mayor (Mr. Alderman Wood) presiding—the Water Committee presented a report in regard to their investigations as to the best source for an additional supply of water for the borough. Some time ago, with the full approval of their Consulting Engineer, Mr. T. Hawksley, the Committee arrived at the conclusion that the most desirable available source of augmentation of supply was the watershed adjoining the Bradgate shed. The watershed now recommended contains (exclusive of the Bradgate overflow) an area of 3500 acres. The Lingdale, Swithland, and Hallgate Brooks, together with the storm overflow from the Bradgate watershed, provide the water proposed to be impounded and appropriated. The site of the intended reservoir is in the valley below Swithland. The Committee, having satisfied themselves of the necessity of securing the means for an augmentation of supply, and that under all the circumstances the one now recommended was the most preferable for the two important reasons of quantity and quality, entered into negotiations with the two landowners whose land will be required for the intended reservoir and works. In the case of one, however, they have been unable to arrange terms; but a conditional contract has been arrived at with the other. An important advantage of this scheme is that it will enable the Corporation to temporarily augment the Bradgate source of supply, without incurring the outlay which will be necessary to further develop the proposed additional watershed. This augmentation may be effected by periodically pumping water into the Bradgate Reservoir or on to the Bradgate filtering-bed.

Alderman Winterton, in moving the adoption of the report, said the question of the water supply was no new thing. It had been before them ever since the old Water Company applied to Parliament in 1876 for an increase of capital. They were then told that the time was rapidly approaching when they would have to ask for fresh powers to increase the supply; and it was decided that the Council should try to get the waterworks into their own hands. This they succeeded in doing. In 1878 the water-drinking population was 100,000 in round numbers. The population now depending on them for water was 174,000; the increase during the last year being in round numbers 10,000—including, of course, the surrounding villages. In view of this rapid increase, he thought they would be wanting in their duty unless they fairly met the difficulty which was coming upon them. They had hitherto done much by a better system of detecting leakages and waste in the water-pipes. The quantity estimated as a fair daily consumption per head was 24 gallons; but two or three years ago a system of waste detection was inaugurated under Alderman Barfoot; and by that means they had reduced the consumption to between 16 and 17 gallons per head per day. This had tided them over the drought of the last two years; for unless the saving had been effected, they would have been at their wits' end. But having thus reduced the consumption, they could not disguise the fact that they were approaching the limit of saving. They might do a little more; but it would be but little. Therefore the Corporation had to consider their responsibility to guard the town from danger as to the sources of water supply. After losing the Blackbrook, that at Swithland and Lingdale appeared to the Committee to be the next best source. There were other supplies open to them; but the water elsewhere was not so good. The water they now proposed to secure was very soft; and about equal to that at Bradgate. There were two landlords with whom it was necessary to deal—Mr. Farnham and the Earl of Lanesborough. They had been in negotiation with them during the past year; and the result with regard to Mr. Farnham was an offer of 55½ acres of land, with the water rights, &c., for £11,000. The opinion of the Committee and of Mr. Hawksley and others was that the price was a large one; but not exorbitant. The Committee recommended the Council to seal the contract with Mr. Farnham. It would not be binding upon them, as it had to be confirmed by a meeting of the ratepayers and approved by Parliament. With regard to the Earl of Lanesborough, they had evidence at first of being met fairly and well. But under some influence or the other, the Earl's advisers seemed to have withdrawn from that position, and preferred to get what they could by arbitration. The terms named were outrageously high. The 55 acres they would

purchase would be of no service whatever without the Earl of Lanesborough's land. The water-works up to the present had been an extraordinary success. They had paid £14,500 into the sinking fund towards the capital, established a reserve fund of £5000, and contributed £29,194 to the rates—making altogether £50,000 which the Corporation had derived from the water-works since they acquired them. The Committee did not wish to plunge into a heavy debt which would take away all their profit, and necessitate an application for a rate to supplement the revenue of the department, and that they thought they would be able to avoid. The profit to be handed over to the rates this year would be £10,000. Every year brought an increase of revenue without any great increase in the cost of maintenance; and yet they were at their wits' end for money. It was ridiculous that they should have in one pocket a large sum of money to pay the rates; while so far as the addition of pipes necessary in the streets was concerned they had none. But they were not allowed to use revenue for additions to the capital account. Any further capital they wanted for new reservoirs or service-pipes they had to acquire in the usual way, and pay back by instalments to the sinking fund. Whether they purchased this property or not, they would be compelled to go to Parliament next session to raise money for the new pipes, &c., which were necessary owing to the growth of the town.

Mr. Hollingworth, in seconding the motion, said he believed the Council would be pretty well unanimous in the matter. In 1887 the Thornton Reservoir was completely empty, and Bradgate was half empty, which showed how easily they might get to the end of their water supplies in a dry time.

Alderman Barfoot supported the resolution. When it was recollected, he said, that during the past year they had one of their reservoirs completely empty, and the other not quite half full, they would see they were within measurable distance of having a shortness of water supply for the inhabitants. After the loss of the Blackbrook, the source proposed was the next best they could possibly have; and the reservoir which was projected was much larger in proportion than that at Bradgate, and it would be found that practically the purity of the water would be slightly better than that at Bradgate.

After some further discussion,

Alderman Winterton said there was still one matter which he (the speaker) desired to mention, and that was in regard to the money they intended to apply for. They would probably ask for £50,000 to meet the growing exigencies of the town in the way of new mains, pipes, &c. This would last them a good many years. Purchasing the land and the ultimate cost of filtering-beds, pumping-stations, and embankments could not come to less than £200,000; so that the vote of the Council and the town would pledge the Corporation some time between now and ten years hence to debit the town with a further debt of £250,000.

The motion was carried unanimously.

BIRMINGHAM CORPORATION WATER SUPPLY.

Report by the Water Committee.

A report on the affairs of their department will be presented by the Water Committee at the next meeting of the Birmingham Town Council. Referring, in the first place, to the results of the adoption of a waste-water meter system in the high-level district, it states that the conclusion at which the Engineer (Mr. J. W. Gray, M. Inst. C.E.) arrived, after a series of careful and complicated calculations, was that, in consequence in a great degree of the system which has been adopted for supervision and insurance of water-fittings, waste of water was not at that time very large in Birmingham; and that, while the convenience to the department from the adoption of the waste-water meter system had been considerable, no sufficient advantage had been obtained to justify the large outlay (probably about £30,000) which would be required for an extension of the scheme to the remainder of the borough. He was further of opinion that under the operation of the bye-laws which were then in course of preparation, and have since been adopted and confirmed, a further reduction in waste might reasonably be anticipated. The cost incurred in applying the system in question amounted, on Dec. 31 last, to £889; being less than the authorized sum of £1200 by £311. Nearly the whole of the outlay represented by the first-mentioned sum was incurred in the year 1885. The laying of the 6-inch main for the purpose of affording a water supply to Acock's Green, which was mentioned in the report of the Water Committee in October last, has now been completed. The cost has amounted to about £671; being less than the estimate by £48. The Committee have for some time past been in negotiation for the purchase of the "Daw" flour-mill, situated on the River Bourne, together with a cottage and about two acres of land—the acquisition of which they consider desirable, in order to give them more complete control of the stream. The Committee have agreed, subject to the approval of the Council, to purchase the property at the sum of £1000. The attention of the Committee has been actively directed to the important subject of a new deep well. Several sites have been under their consideration; and they hope they may shortly be in a position to submit their recommendation to the Council. Since the report of the Committee on Oct. 2 last, mortgages have been paid off to the extent of £400, and loans received amounting to £11,822; the excess of £11,422 being required for new capital. This sum added to £3021 (mentioned in the Committee's report of Oct. 2), constitutes a sum of £14,443 applied as follows:—For capital expenditure on extension of works, £11,693; for recouping Treasurer in respect of overdraft on capital account to Dec. 31, 1887, £2750. In submitting the profit and loss account and balance-sheet of the department for the year ended Dec. 31, the Committee congratulate the Council on the fact that, for the first time since the reduction of water-rents in 1883, the accounts show a surplus of profit; the amount being £105. The following shows the loss on each year's operations since the reduction took place:—1883, £4173 15s. 3d.; 1884, £8940 6s. 10d.; 1885, £7642 12s. 3d.; 1886, 5468 9s. 4d.; 1887, £2019 15s. 4d. The surplus of £105 for last year being deducted from the aggregate deficiency of £20,128, reduces it to £20,023. The sum of £2000 interest on the reserve fund of £50,000 has been paid to the City Treasurer. The statistical tables appended to the report show that the water-rental amounted to £124,658; and other smaller items brought the total receipts up to £126,246. Deducting from this the expenditure, there remained £82,666; and after annuities, interest, &c., had been met, the small balance of £105 (alluded to above) remained.

Suggested Purchase of the Welshpool Gas-Works by the Town Council.—At last Tuesday's meeting of the Welshpool Town Council, Mr. Pryce, pursuant to notice, introduced the question of the purchase of the local gas-works. He said he did not intend to make a speech, but should content himself with proposing that the Town Clerk be instructed to write a letter to the Chairman of the Welshpool Gas Company, to ascertain upon what terms they would be willing to dispose of their works to the Corporation for. Mr. Jones seconded the motion; and it was agreed to.

PLYMOUTH CORPORATION WATER SUPPLY.

The Detection of Waste.

At the Meeting of the Plymouth Town Council last Friday week—the Mayor (Mr. H. J. Waring) presiding,

Mr. Moon, the Chairman of the Water Committee, made a verbal report as to the action taken for suppressing waste of water in the borough. He reminded the Council that altogether 37 meters had been purchased; and remarked that the results obtained showed that, in the opinion of the Committee, the Siemens meters occupied the premier position for the detection of waste of water. In 9430 houses which the inspectors had visited, there were found to be 2272 sources of waste, of which only 246 were underground. All the underground leakages were in lead pipes; not a single iron main being defective. These facts falsified the prediction which was made, that the mains and underground services were in a lamentable condition. In the Barbican district alone, the consumption of water was found to be 67 gallons per head per day. A leakage was discovered in a defective water-closet; and on its being remedied, the consumption at once fell to 37 gallons, a single leakage having wasted 30 gallons per head per day over a whole district. In How Street, from a similar cause, 20 gallons of water per head of the district were wasted daily. In 17 districts the consumption was reduced from 35 to 27 gallons. By September the meters were in operation in thirty districts, and the consumption was reduced from 35 gallons at the commencement of the inspection to 22 gallons in October—a saving over the whole of the districts of 13·2 gallons per head per day. In thirteen of the thirty districts, the daily consumption was below 20 gallons per day, or 36·5 per cent. Since October the consumption had continued to decline; and on the 18th inst. it was reported to be 20·9 gallons per head per day over the whole of the districts governed by the meters. In many cases the inspectors had been obliged to pay repeated visits to certain houses where defects existed in the water apparatus; the leakage having broken out afresh very soon after the repairs had been executed. To remedy this state of things, the Water Committee intended to present a report recommending the Council to follow the practice adopted in many other towns in the kingdom, and require taps and services of a particular kind to be fixed in all new buildings, and in dwellings where defects were constantly occurring. When this was done, the town would compare favourably with any in the kingdom as to the efficiency of its precautions against waste of water.

Mr. Harris attributed the gratifying check in the waste of water more to the house-to-house inspection than to the meters. He hoped they would not be asked to purchase any more meters; but that the inspection would be continued until the storeage reservoir was constructed. Plymouth would be better prepared for a drought next summer than it had been for many years past.

Mr. Harvey asked what proportion of the town the thirty districts under meter supervision represented?

Mr. Moon replied that it was difficult to tell exactly what proportion they were dealing with, because when the consumption in one district was reduced to a normal point, the meters were transferred to another About 5000 houses were, however, under supervision.

Mr. Harvey congratulated the Water Committee on the success that had attended their efforts, and pointed out that the underground leaks could not have been discovered without the meters. If the daily consumption over the whole town were reduced to 25 gallons per head, there would with an inflow of over 3 million gallons—the smallest quantity they had had for years—be an ample supply for the whole of the inhabitants.

Mr. Latimer considered it due to the Deacon meter system to say that whatever benefit they were now deriving from the use of the Siemens meters was owing primarily to the introduction of the Deacon meters into the town. It was to him a matter of regret that they treated the representative of the Deacon system so badly.

Mr. E. James reminded the Council that for several years he had declared that sufficient water entered the leat at the Head Weir to meet the requirements of the town, and that the inadequate supply was owing to defects in the distribution service. By the piping of the leat from Knackersknowle to Roborough, a saving of 700,000 gallons a day was effected; and a still greater waste had been put a stop to in the town by the adoption of the meter system. With the daily consumption reduced to 22 gallons per head, no one was heard complaining of want of water. In the face of these facts, he asked whether there was any necessity for a storeage reservoir at all.

The Mayor observed that he had given Mr. James, perhaps, a little too much latitude; but he could not permit a discussion on the reservoir question.

The Borough Surveyor, in reply to a question, said there were at present seven inspectors in the employ of the Corporation.

The Council then proceeded to other business.

THE LEAD-POISONING IN THE BRADFORD OUT-TOWNSHIPS.

The epidemic of lead-poisoning in the out-districts of Bradford (to which several references have lately been made in our columns) is causing much consternation in the localities affected; and the minds of the local authorities are much exercised as to the cause of the sudden development of this dangerous malady. The outbreak is the more difficult to understand because, although fully 50,000 of the inhabitants of the borough are using the same water as that which is supplied to the out-townships, not a single case of lead-poisoning has been reported as having occurred within the boundary. Among the many theories advanced to account for the sudden development of lead-poisoning, is one that the water from the Corporation's high-level supply possesses peculiar properties which have the result of increasing the danger of poisoning. This notion may, however, be at once dismissed when the statement just recorded is considered—viz., that 50,000 people in the borough use the water, and not one has suffered in this way. The more reasonable view of the matter is—and this is the opinion of the Corporation Water Committee—that in the townships where lead-poisoning has occurred, there has not been a sufficiently frequent flushing of the mains. The Corporation have paid the greatest possible attention to the complaints which have been made from various quarters; but only admit responsibility to the extent of putting pure water into the mains. Dr. Whitterton and various members of the North Bierley Local Board have had interviews, and been in correspondence with the Water Committee upon the subject; and on behalf of the Corporation, samples have been taken from the mains at various points in the district where cases of poisoning have occurred, and from all the high-level reservoirs. These have been analyzed by the Borough Analyst (Mr. Rimmington) and declared to be free from lead. In regard to the supposition that the water acts on the lead service-pipes, it was stated at a recent meeting of the North Bierley Local Board, that in fifteen cases which were in the hands of the Medical Officer (Dr. Whitterton), the patients occupied houses where there were no lead service-pipes. It has been suggested that concerted action should be taken by the Local Boards, with the object of either inducing the Bradford Corporation to

filter the water before it is supplied to the out-townships, or, on the other hand, to relieve them from the responsibility of being compelled to take the water from the Corporation. Two members of the North Bierley Local Board had an interview with the Works Sub-Committee of the Corporation yesterday week, when Alderman Robertshaw stated that, in accordance with a suggestion which had been made, samples of water taken from the two high-level reservoirs—Brayshaw and Horton Bank Top—whence the supply of the North Bierley district is derived, had been analyzed, and in none of the samples was there any trace of lead.

THE WATER SUPPLY OF ELLAND.

The Elland Local Board are taking steps to improve the water supply of the district over which they have jurisdiction; and they recently requested Messrs. Crowther, Engineers, of Huddersfield, to advise them on the subject. Messrs. Crowther have sent in their report, which deals with the existing supply, which they consider inadequate, and the necessary remedial works. The water, they say, is now supplied in bulk by the Halifax Corporation out of their Victoria Reservoir, having a top water-level (when full) of 790 feet above Ordnance datum. From thence for five furlongs the conduit consists of two cast-iron pipes of 12 inches and 10 inches diameter; then is continued for about one mile in a 10-inch main; and for six furlongs more, in an 8-inch main pipe to Salterhebble. At Salterhebble the 8-inch pipe is divided into two of 6 inches diameter—one going forward to West Vale, and the other to Elland Woodside, where the water is passed through duplicate 6-inch meters directly into distribution pipes; no carrier mains having been laid down within the district supplied. This method of distribution they condemn strongly, because the water is commenced to be served under an abnormal pressure of 500 feet—a system detrimental to the correct working of the meters and to economy in water, as great waste must occur in distribution pipes and ball hydrants where the day and night pressures vary to the extent of 300 and 400 feet, equivalent to 150 lbs. to the square inch; the contour to which the ordinary daily supply is reached being about 350 feet Ordnance datum, and varying downwards another 100 feet as the draw upon the pipes for trade consumption fluctuates. For supplying the high levels, two small automatic tanks have recently been constructed at Elland Upper Edge and Blackley, at about 688 feet Ordnance datum, which are filled during the night; the water being returned by reflux valves. Messrs. Crowther advise, among other things, that the Board should construct a service reservoir of not less than 480,000 gallons capacity on the contour of 530 feet Ordnance datum, at Dunce Park, about 300 feet above Elland Bridge—the lowest place of service; that the system of distribution should be revised, whereby this intended service reservoir will give out all water required below the contour of 430 feet Ordnance datum, leaving the higher levels to be supplied from the Elland Upper Edge and Blackley tanks; and that a new 8-inch supply-main should be laid from Salterhebble, being the terminal point of the 8-inch main from Halifax, to the intended service reservoir. A large number of alterations in the distribution mains are recommended in the report; and these additions and changes will give, it is said, a constant supply under proper pressure to the whole of the district, except a few houses at Lower Edge, which are supplied from Rastrick. The scheme generally is estimated to give about twice the present quantity of water. The estimate for the whole work is £4600. At the meeting of the Local Board at which the report was presented, the Chairman stated that he concurred in Messrs. Crowthers' calculations as to the future requirements of the district; and, after some discussion, it was resolved that the report be accepted, and also that the Clerk be instructed to apply to the Local Government Board for borrowing powers to enable the Board to carry out the works. It was understood that the construction of the new reservoir should be at once proceeded with, so as to remedy the present deficient supply of water in the upper portion of the district.

PROPOSED ADDITIONAL WATER SUPPLY FOR BAILDON.—A Local Government Board inquiry was held at Baildon last Wednesday, by Mr. S. H. Terry, into the matter of an application by the Local Board for sanction to borrow £2500 chiefly for purposes of water supply. In 1885, the Board purchased one-third of the water rights of the Birch Close spring, and now intend to acquire the remaining two-thirds, at a total expenditure of £1500—the negotiations having been opened in 1887, when the district experienced a scarcity of water owing to the drought.

PROPOSED ADDITIONAL WATER SUPPLY FOR SANDBACH.—The Sandbach Local Board having applied for a loan of £7500 for purposes of water supply, Mr. S. J. Smith, C.E., one of the Inspectors of the Local Government Board, has just held an inquiry into the matter. Evidence was given as to the quantity of water which could be obtained by pumping at Taxmere, a distance of about 1¼ miles from the town; it being stated that more than 100,000 gallons per day could be procured if required from that source. The Inspector intimated that the Local Government Board had analyses of samples of water taken from this source; and they were found to be of a turbid nature, which if removed would make them of good quality for drinking purposes. It appeared from further evidence that the water is to be softened by the Clarke process; and an analysis had been taken which showed that the water was of good quality after being thus treated. It is proposed to have the pumping station and the water tower together on land belonging to Lord Crewe; and it is expected that the cost will not amount to the sum proposed to be borrowed.

THE PROPOSED NEW WATER-WORKS FOR COVENTRY.—Last Wednesday week a statutory meeting of the owners and ratepayers of Coventry, convened by the Mayor (Alderman Tomson), was held, to consider the expediency of consenting to the promotion, in the next session of Parliament, of a Bill to empower the Corporation to make additional water-works, and for other purposes. His Worship proposed a resolution formally approving of the Bill. He pointed out that the attention of the authorities had been frequently called to the necessity of providing a further water supply, and that if they neglected so obvious a duty, the Corporation would incur a very grave responsibility. The Bill would be of a permissive character; and no portion of the scheme would be carried out, and no part of the £54,000 would be spent, unless it was found to be absolutely necessary. Alderman Matterson (Chairman of the Water-Works Committee) seconded the resolution; and, after some discussion, it was carried by a large majority.——At the meeting of the Guardians of the Poor of Coventry Union on the same day, Mr. West asked if the Surveyor could tell them what would be the effect on the Radford water supply, which was at present obtained from springs, when the Corporation had sunk the proposed borehole, as part of the new water scheme. The Surveyor said the effect would be to dry up all the old spring, wells and ponds, which had existed for 200 years. He suggested that a Committee should be appointed to meet the Water-Works Committee of the City Council, and to watch the interests of the Radford people. This was agreed to.——The deputation of the Guardians have since had an interview with the Water Committee of the Corporation, and received a general assurance that the Committee will have regard to the public interests of Radford.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

The chief item of business before the Edinburgh and Leith Gas Commission on Monday was the question of reconstructing the retort-house at the Edinburgh works. This was a work the necessity for which the Company in its day were fully alive to; but their desire was to transfer the works to a new site, and so the renewing and modernizing of the carbonizing plant was, in a sense, put off to wait the turn of events. For the present, the Commissioners have sufficient liability on their hands, in the shape of the costs connected with the transfer and other incidental charges, as to make them cautious in incurring expenditure. Besides, until they have time to feel their way, it would be out of place for them to entertain any extensive scheme for the removal of the works. And so, the necessity being forced upon them of doing something, they are thrown back upon the old works, and to the consideration of improving them. The Commissioners are fortunate in possessing the services of Mr. Robert Mitchell, the Engineer—a gentleman whose resource in the management of works under difficulties called forth a high encomium from Mr. George Livesey, when the Edinburgh Company were before the Parliamentary Committee. Mr. Mitchell is an old investigator into the question of regenerator retort-firing. Located at Coatbridge in the vicinity of large iron smelting works, he had exceptionally favourable opportunities for observing the methods of handling carbonic oxide in furnaces; and when the employment of carbonic oxide along with secondary air for the heating of retort-ovens in gas-works came to the front, he at once adopted a distinctive principle in the application of the new heating system, to which he has stuck ever since. Retorts on his method of setting have been in use in the Edinburgh works for several years, and careful observation of them has shown that they give results equal to what are obtained from any form of setting in use. The Commissioners have adopted Mr. Mitchell's scheme, and have sanctioned the erection in accordance with it of 40 ovens, each with eight retorts. The plans for the new works have been prepared by Mr. Mitchell; and he has to-day been engaged in multiplying copies by photographic means, thereby effecting a large saving to the Commissioners. The scheme shows a bench of retorts set in a double row back to back, with producers underground; but with this peculiarity, as it may be called, that the producers are situated at one side only—each producer having to serve the two ovens which are back to back opposite it. In this way, the expense of excavating one side of the retort-house is saved, as well as the cost of constructing and working an extra set of producers. One-half of the producer is under the oven; and the passage for the carbonic oxide gas is led to the division wall between the ovens, whence it branches off to back and front, and in each oven there are four openings, increasing in size to the furthest end, for the admission of the gas to the oven. The air passages, of course, discharge by openings corresponding in size and situation. There being gas and air passages on each side of the oven, combustion takes place at eight different points in each. The retorts will be of ⌂ shape, 21 in. by 15 in. by 9 feet; capable of carbonizing from 20 to 21 cwt. of coal per day. The scheme of reconstruction, when carried out, will place the entire works at Edinburgh under a substantial iron and slate roof; the portion to be dealt with being at present roofed with tile, and not in the best condition. The appearance of works will be considerably improved.

Mr. Andrew Terrace (the brother of Mr. J. B. Terrace, Manager of the Brechin Gas-Works) has been appointed Manager of the Lasswade and Bonnyrigg Gas Company, near Edinburgh.

On Wednesday afternoon the two new filters which have been constructed by Messrs. James Young and Sons, of Edinburgh, at Alnwick Hill, for the Edinburgh Water Trust, were formally inspected by the Trustees; and thereafter, Lord Provost Boyd turned on the water. Bailie Archibald, of Leith, addressing the company, said that the extent of land occupied by the old filters was 15½ acres, which cost £9300; the works for the filters costing £68,500. The land recently acquired by the Trustees extended to 10 acres; and they paid £6500, for it while the new filters cost £12,000. The whole cost of the upper tank filters and clear tanks was £97,000, all of which had been rendered necessary for the purpose of filtering the water from the Moorfoots, particularly that from Gladhouse reservoir. The filters themselves occupied about 3 acres of land; and there being in all six filters, they took up ½ acre each. He further stated that the available sources of supply of the Trust could yield 16 million gallons of water per day, and that at present fully 15 million gallons were being used in the whole area of supply; so that there was a surplus of only about a million gallons.

A newspaper paragraph in the following terms appears this week:—"We understand a proposition to light some of the streets of Berwick by means of electricity has been before the Lighting Committee of the Urban Sanitary Authority, some of the members of which look with favour upon it, especially as there is said to be some chance of the electric light being as economical as, if not more so than, gas. The port of Blyth is now lighted by electricity; and the agent of the Company which provided the light there has been at Berwick recently, supplying information as to its cost." This simply means that the Corporation are being canvassed by an enterprising electric lighting agent, and that they probably have not yet heard of the results attending electric lighting in other places—such, for instance, as Leamington and Barnet. Berwick has always appeared to me to be a particularly well-lighted town; and I cannot think that the proposal originates from any complaint about gas lighting. If the town revenues were superabundant, there would be little harm in the Corporation making a small experiment in lighting. But that is a condition in which they are not; a decrease in the value of land which the Corporation holds having left the finances rather tight. The Corporation had therefore, better consider well what is the "chance of the electric light being as economical as, if not more so than, gas," before they embark on a new adventure.

Sheriff Dove Wilson, of Aberdeen, has issued his judgment in appeals taken by owners of property against a decision by the Local Authority of Insch to form a special water supply district. The Sheriff finds that on one property adjoining the town, there are several dwelling-houses at present supplied by two wells, one of which has been condemned, and the other they have not been permitted to analyze. Considering the nearness of the properties to the town, he comes to the conclusion that the underground water must be tainted, and that the use of it would be a source of danger to the whole community. He therefore dismisses the appeals, and directs the properties to be included in the special water supply district.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

There seems to be at present a prospect of the Glasgow Corporation Gas Undertaking for the current financial year turning out to be decidedly successful. Notwithstanding the reduction of 2d. per 1000 cubic feet in the price of gas, the income from gas-rents is materially increased. I am told that up to now the income from this source is between £800 and £9000 in advance of what it was at this time last year, for 1887-8; and from figures which I have already given in the JOURNAL, the increase in

the consumption of gas during December will be found to have reached nearly 20 million cubic feet. It is very satisfactory to be able to say also that the income derived from secondary products is showing a material increase as compared with that for the last financial year.

The annual meeting of the shareholders of the Coatbridge Gas Company was held last Tuesday. The Directors' report for the half year ending Dec. 31, 1888, was unanimously approved of; and maximum dividends, at the rate of 10 and 9 per cent. per annum, on the old and new stocks respectively, free of income-tax, were declared.

Some time ago ex-Bailie Dickson, who holds a prominent position on the Watching and Lighting Committee of the Glasgow Town Council, made a statement regarding the wages paid to stair-lamplighters, which has brought quite a "nest of hornets" about his head. It was to the effect that these men got a total of 11s. 9d. per week for a start, and that their wages rose as high as 21s. per week. One of the stairlighters, who gives the initials of his name, and says that he has been at the work for five years, challenges the ex-Bailie's statement in very direct terms. When taken on, he was a "sub.," which he remained for nine months, receiving 6d. a day for attending and going round night after night learning up the beats. Occasionally he was on for one of the hands who was laid up with sickness, and then he received 1s. 6d. a day; but he did not get the "sub." pay for the day that he was working a beat. When stationed on a beat of his own, he received 10s. 6d. a week for six months, 12s. a week for the following twelve months, and he is now receiving the highest pay that is given—viz., 13s. a week. Another of the stairlighters, who writes to one of the local newspapers, confirms the foregoing data in all essential particulars; so that it would seem that the ex-Bailie must have been drawing upon his imagination for his facts, with the result of leading the ratepayers to believe that the men were well paid for their work. It is surely time for him to correct the error that he has stated in public, and which has been very widely disseminated.

There has been a great want of animation in the Glasgow pig-iron market all the week, with the exception of Thursday, when it was intimated that the Bank rate had again been reduced ½ per cent. Down to 40s. 10d. per ton cash was accepted for Scotch warrant iron yesterday; so that over the week the price has declined about 8d. per ton. There is still an absence of outside speculators; and in the hands of the "bears" the market has gone steadily back. The position of general trade is much improved; there being a distinctly healthy tone in all branches, and consumption is said to be very great. The number of blast-furnaces now in actual operation is 79, as compared with 83 at the same time last year.

An active demand is being experienced in every department of the coal trade; and prices are firming. Steam coal has risen in price 6d. per ton during the week; the rate being from 8s. to 8s. 6d. per ton f.o.b. Glasgow Harbour coaling-cranes. Splint coal is quoted at 7s. 6d. to 8s. per ton.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 2.

Sulphate of Ammonia.—During the closing days of January, and as soon as speculators who had contracts to fulfil could breathe more freely, the energies of these dealers were devoted to the bringing about of a breakdown in the market. They seem to rely upon the dulness of the Continental demand for the success of their manœuvre; and the London quotations already bear towards the realization of this purpose. A downward tendency at the present moment would appear all the more fictitious, because not only were there anxious buyers but a fortnight ago at the extreme prices (and the position has not changed for the worse since), but no sooner do parcels come on the market than they are still readily bought up, if only moderate concessions are made by the sellers. There is every indication, too, that the reticence of consumers abroad and at home will not be of long duration; and nobody can profess to be blind to requirements which, in consequence of circumstances, are being delayed to the latest moment. It must not be forgotten that the bulk of the winter production has been dealt with; and the state of the weather, so far, seems to favour the use of sulphate in preference to nitrate. The latter keeps steady. At the close, £12 7s. 6d. and £12 10s. per ton are still makers' prices; but parcels emanating from dealers' hands are stated to be obtainable at £12 6s. 3d. and below. According to makers' present engagements, there will not be a large quantity of sulphate for disposal during February, at all events as far as the country is concerned.

LONDON, *Feb.* 2.

Tar Products.—During the week these have been steady; the principal improvements having taken place in pitch and carbolic. There is not so much inquiry for benzole, although the figure has not varied a great deal. Prices may be taken as follows:—Tar, according to position, 18s. to 24s. per ton. Benzole, 90 per cent., 3s. 1d. per gallon; 50 per cent., 2s. 5d. Toluol, 1s. 6d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 30 per cent., 1s. 2d. per gallon. Light oil, 3d. per gallon. Creosote, 2d. per gallon. Pitch, 20s. to 25s. per ton. Carbolic acid (crude), 3s. 7½d. per gallon. Cresylic acid, 11d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 4d. per unit; "B" quality, 1s. 2d.

Ammonia Products.—Sulphate has been flat, and sales difficult to effect, even at the lower prices. To-day's figures are as follows:—Gas liquor (5° Twaddel), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Sulphate of ammonia, £12 2s. 6d. to £12 7s. 6d. per ton, less discount. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3½d. per lb. Muriate of ammonia, brown, £20 per ton; white, £26 10s. Sal-ammoniac, £32 per ton.

THE Taunton Electric Lighting Company, Limited, have just declared a dividend of 6 per cent.

THE Newcastle and Gateshead Gas Company's dividend for the past half year will be at the rate of 9 per cent. per annum—the same rate as last year.

INTIMATION has been received by the Cleckheaton Local Board from the Local Government Board that a public inquiry will be instituted with reference to an application by the Local Board to borrow £12,000 for extending the gas-works.

ON Monday last week, a deputation waited on the Directors of the Manchester Chamber of Commerce for the purpose of asking that the Board should establish a Sectional Committee in the Chamber of Commerce charged with the furtherance of the development and extension of the chemical and allied industries of the country. A memorial which had been prepared, and which was extensively signed, was read; and Mr. I. Levinstein, Mr. G. E. Davis, and others, addressed the Board in support of it. The President, in reply, said it was a question of vital importance to the whole trade of the district that what they might for shortness call the chemical section should have ample representation on that Chamber and that Board. Without committing the Board, he might say he was very glad the deputation had come there; and personally he would do all he could to further its objects.

REDUCTION IN THE PRICE OF GAS AT CHELTENHAM.—The Cheltenham Gas Company have determined to reduce the price of gas from 2s. 8d. to 2s. 6d. per 1000 feet, to take effect from the commencement of next quarter.

BELL'S ASBESTOS COMPANY, LIMITED.—At the first ordinary meeting of this Company, held last Wednesday at the City Terminus Hotel, under the presidency of Mr. J. Bell, the Chairman, the Directors reported a sum of £28,584 available for appropriation; and they recommended a dividend of 15s. per share, free of income-tax, which, with the interim dividend paid in July last, would make a total distribution of 22½ per cent. for the year, and leave a balance of £3834 to be carried forward. This was agreed to. A continuous increase was reported in the Company's business.

LEEDS CORPORATION WATER SUPPLY.—Satisfactory progress is being made with the construction of the Blackmoor tunnel—the new additional outlet from the Eccup reservoir. When it is finished, the tunnel will be 2200 yards long. So far, 611 yards of that distance have been completed; and it is confidently anticipated that the tunnel will be ready for use within the time stipulated for its completion. Yesterday week the Water Committee visited the works, and were gratified to find no leak from the old tunnel into the workings, with the exception of a small one near the mouth of the new tunnel. Save for a short length of shale, the whole of the excavation for the new tunnel has had to be done by blasting; one of the many forms of dynamite being found most effective for removing the hard millstone grit which has been met with so constantly.

NORTHERN COAL TRADE.—There is much greater animation in the coal trade of the north of England this week, both in the steam coal and gas coal branches. In steam coals, all the pits are now kept fairly well at work—a feature which is very novel at this period of the year—and at prices very different to those that rule in the time when the northern navigations are closed. For best steam coal, about 10s. per ton is the current quotation; but the actual price depends more on the time allowed for the order, and the pressing character or otherwise of the needs of the user. Small coal is a little more plentiful at something like 2s. 6d. per ton. In gas coal the demand is still large; and the fact that the miners have obtained an advance of 1½ per cent. under the sliding scale, may be taken as a sign of the course of prices of late. One large contract for gas coals for Hamburg has been recently given out to Tyne collieries; and although the actual price has not transpired, it is believed that it shows an advance on the price under the last contract of fully 2s. per ton—a rather sharp advance. Household coal is very dull; the mild weather restricting purchases.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 237.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p. c.	10	13¼—13¾	..	5 11 1
800,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	100	110—112	..	4 9 3
100,000	20	29 Nov.	10	Bahia, Limited	20	24—26	+½	7 13 10
200,000	5	14 Nov.	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	5¾—5¾	..	5 4 2
380,000	Stck.	29 Aug.	11½	Brentford Consolidated	100	228—233	+1	5 0 10
125,000	,,	,,	8	Do. New	100	167—172	..	5 1 9
220,000	20	13 Sept.	10½	Brighton & Hove, Original	20	43—45	..	4 13 4
320,000	20	28 Sept.	11½	British	20	44—46	..	4 17 10
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	20—22	..	5 0 0
39,000	10	,,	8	Do. 7 p. c.	10	13¼—14¼	..	5 10 4
328,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	13¼—14¼	..	5 10 4
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107—110	..	5 9 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	26—28	..	5 0 0
550,000	Stck.	12 Oct.	13½	Commercial, Old Stock	100	263—268	+1	5 2 7
130,000	,,	,,	10½	Do. New do.	100	214—219	..	4 18 2
180,000	,,	28 Dec.	4½	Do. 4½ p. c. Deb. do.	100	122—125	..	3 12 0
557,320	20	13 Dec.	13	Continental Union, Limited	20	48—50	..	5 4 0
242,680	20	,,	13	Do. New '69 & '72	14	34—36	..	5 1 0
200,000	20	,,	10	Do. 7 p. c. Pref.	20	38—40	..	5 0 0
75,000	Stck.	28 Sept.	10	Crystal Palace District	100	205—215	..	4 13 0
234,060	10	30 Jan.	13	European, Limited	10	25—26*	+½	5 0 0
120,000	10	,,	13	Do. New.	5	17½—18½*	+½	5 5 3
354,060	10	,,	13	Do. do.	5	12—13*	+½	5 0 0
5,468,600	Stck.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	261—265	+3	4 18 1
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	263—267	..	3 14 10
30,000	,,	,,	5	Do F, 5 p. c. Prf.	100	125—130	..	3 16 11
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	170—175	+1	4 0 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	261—265	..	3 15 6
1,061,150	,,	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	120—123	+2	3 5 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	125—130	+3	3 9 3
650,000	,,	,,	6	Do. 6 p. c. do.	100	174—179	+2	3 7 0
3,600,000	Stck.	14 Nov.	10	Imperial Continental	100	210—214	..	4 13 5
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	115—117	+1	4 5 6
541,920	20	29 Nov.	6	Monte Video, Limited	20	19—20	..	6 0 0
150,000	5	29 Nov.	10	Oriental, Limited	5	9¼—9½	..	5 2 7
60,000	5	28 Sept.	7	Ottoman, Limited	5	6—7	..	5 0 0
166,870	10	16 Jan.	4	Pará, Limited	10	5½—6	..	6 18 4
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	104—107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	92—97	..	6 3 9
100,000	10	12 Oct.	10	San Paulo, Limited	10	15¼—16½	..	6 1 2
500,000	Stck.	29 Aug.	15½	South Metropolitan, A Stock	100	310—315	+5	4 18 5
1,350,000	,,	,,	12	Do. B do.	100	242—247	+2	4 17 2
141,500	,,	,,	13	Do. C do.	100	250—260	+5	5 0 0
600,000	,,	28 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137—140	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'ntn, Orig.	5	11—13	..	4 4 0
				WATER COMPANIES.				
717,467	Stck.	28 Dec.	9	Chelsea, Ordinary	100	259—264	..	3 8 2
1,720,560	Stck.	12 Oct.	7	East London, Ordinary	100	203—206	..	3 8 0
700,000	50	13 Dec.	9	Grand Junction.	50	121—125	..	3 12 0
708,000	Stck.	10 Aug.	10½	Kent	100	277—282	..	3 14 5
1,043,800	100	28 Dec.	9	Lambeth, 10 p. c. max.	100	254—259	+1	3 9 6
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 3
200,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118—122	..	3 5 7
500,000	100	27 July	12½	New River, New Shares	100	350—360	..	3 7 4
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	100	123—126*	+½	3 3 6
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c. max.	100	167—172	..	3 9 9
126,500	100	,,	6	Do. 7½ p. c. do.	100	161—166	..	3 12 3
1,155,066	Stck.	,,	10	West Middlesex	100	265—270	+1	3 14 1

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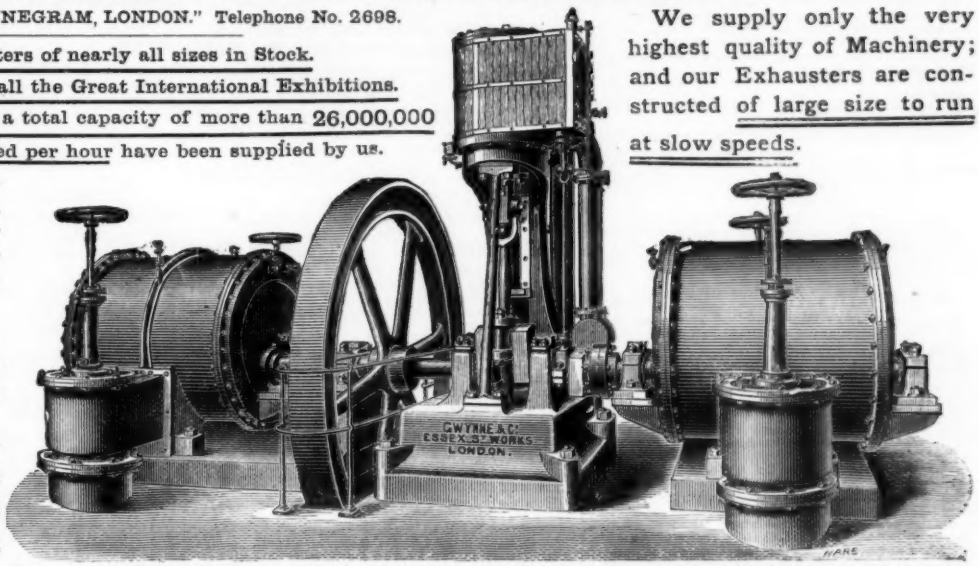

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Dec. 29, 1888.

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*** See Advertisement on Page III. of the Wrapper of last week's issue.

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Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 264 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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H. H. HOBBS, formerly Managing Foreman during the construction of the Beckton Gas and Chemical Works, seeks RE-ENGAGEMENT; Home or Abroad.
4, Mayes Road, WOOD GREEN, N.

WANTED, by a young Man (aged 21), a SITUATION in a Gas Office. Has held a similar Situation for the past Six years. Used to Reading Indices of Meters and Collecting. Can use the Photometer. Total abstainer. Good references.
Address W. R. COLLIER, Skinningrove, R.S.O., YORKS.

COLCHESTER GAS COMPANY.

WANTED, an experienced Engineer and MANAGER to take charge of the Gas-Works and General Business of the Colchester Gas Company.
He must have a thorough scientific and practical knowledge of the Manufacture and Distribution of Gas, and the Manufacture of Sulphate of Ammonia. He must also have a practical acquaintance with Main and Service Laying.
He must be competent to design and prepare plans for, and carry out all constructive works and alterations that may be required.
His whole time must be devoted to the duties of his office. He must not be under 30, nor more than 50 years of age.
The make of Gas is about 100 million cubic feet. Salary, £300 per annum, with Residence at the Company's Works, free of Rates and Taxes, and also the free use of Coal and Gas.
Satisfactory security to the amount of £300 will be required.
Applications, stating age, qualifications, and present employment, with not more than three testimonials of recent date as to capacity and character, must be sent to the undersigned, not later than the 15th of February inst., endorsed "Gas Manager."
Any applicant canvassing the Directors will be disqualified.
J. B. HARVEY, Chairman.
Oxford Road, Colchester,
Feb. 2, 1889.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Co.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour.
Highest References and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Tools, and Sundries.
*** See large Advertisement in last week's issue page 18 9.

SULPHURIC ACID.

HUGH WALLACE & CO., Chemical Manufacturers (the old-established firm), supply the above, which is specially adapted for making White Sulphate of Ammonia. The latter purchased in any quantities at highest market prices, or contracts for the year.
For price and terms apply Botolph House, Eastcheap, LONDON, E.C.

WANTED, for a Provincial Works, a steady Man as LEADING STOKER. Wages 31s. per week. One used to the Scoop, and an abstainer preferred.
Apply (by letter only) to No. 1671, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Second-hand Gas Purifiers, with Change-Valve and Pipes.
Particulars, stating price, &c., to be sent to the MANAGER, Allhusen's Works, South Shore, GATESHEAD.

FOR SALE—Three Boiler Tanks in first class condition; sizes about—
26 ft. 0 in. by 9 ft. 0 in.
29 „ 9 „ by 9 „ 0 „
23 „ 6 „ by 7 „ 0 „
Also several large WAGGON BOILER TANKS and STEAM-PUMPS.
Address CULPAN & SONS, Heckmondwike, YORKSHIRE.

PURIFIERS, &c., for Sale (cheap), erected complete, in perfect working order, practically equal to new.
Four Purifiers (London), 14 ft. square by 4 ft. deep, with Wrought-Iron Covers, Lifting Gear, and Crab. Makers, C. and W. Walker.
Also Four Purifiers (near Leicester), 12 ft. by 9 ft. by 3 ft. 6 in. deep, with 10-inch Centre-Valve and Connections, and Lifting Gear.
Also Cast-Iron Tank and Gasholder, 40 ft. diameter by 12 ft. 6 in. deep, complete.
Also smaller sizes in Purifiers, and various sizes in second-hand Gasholders, Scrubbers, Condensers, Station Governors, Exhausters, Station Meters, Gas-Valves, &c. Enquiries invited.
Apply to SAML. WHILE (late Ashmore and While) 60, Queen Victoria Street, LONDON, E.C.

STENCIL PLATES.

TO ENGINEERS AND ALL WHO DRAW PLANS.

TO BE SOLD, a magnificently executed Set for LETTERING PLANS, &c. The Set consists of TEN COMPLETE SETS of ALPHABETS, plain, shaded, and ornamental; FOUR SETS of FIGURES in various Styles; and FIFTY PLATES of all the principal words used upon Engineering Drawings, including Scales, Points, Corners, &c., in a mahogany case, with Brushes. Price for the whole 30s.

Apply to Mr. G. BAKER, 22, Orpingley Road, Hornsey Road, LONDON, N.

THE Ashford (Kent) Gas Company have for Sale:—

A round cased STATION METER (4000 cubic feet per hour), with 6-inch hydraulic four-way valve, and 6-inch connections.

A SCRUBBER 5 feet diameter, 16 feet high, with boards, tippler, and two 10-inch rack valves, and connections.

A 10-inch (dry) CENTRE-VALVE.

Particulars from and offers to JOHN MORTON, Gas-Works, Ashford, KENT.

HERTFORD.

TO TRUSTEES, INVESTORS, AND OTHERS.

IMPORTANT SALE OF SHARES IN THE HERTFORD GAS-LIGHT COMPANY.

MESSRS. MEDCALF & SON have been favoured with instructions from the Directors to Sell by Auction, at the Corn Exchange, Hertford, on Saturday, Feb. 2, 1889, at Four o'clock precisely, 200 NEW £10 SHARES in the HERTFORD GASLIGHT COMPANY. (Such New Shares to rank for Dividend with the Original Shares up to Seven and a Half per cent.)

The Auctioneers beg to draw special attention to this excellent opportunity for investment in the above Company's Shares, which always command a ready Sale when offered for competition.

Particulars and conditions may be had of Messrs. SWORDER AND LONGMORE, Solicitors, HERTFORD; of Mr. R. W. BRETT, Secretary to the Company; and of Messrs. MEDCALF AND SON, Auctioneers and Estate Agents, HERTFORD.

TAR.

THE Directors of the Reading Gas Com- pany are prepared to receive TENDERS for the purchase of their TAR for One year, from the 1st of April next.

Specifications for the contracts can be seen at my Office, or will be sent on application.

Rail and Water Communication direct to the Works.

Tenders to be sent not later than Monday, the 18th of February, to

ROBT. BRADLEY, Secretary.

Office: 22, Market Place, Reading,
Jan. 29, 1889.

TO GAS-WORKS ENGINEERS AND OTHERS.

THE Borough Surveyor of Bury St. Edmunds invites TENDERS from persons prepared to purchase and remove at once about 580 lineal yards of 9-inch CAST-IRON SOCKET-PIPES in 9 feet lengths, weighing about 5¼ cwt. each.

The Pipes have been used as a Rising Main to the late Sewage Farm, and have been removed owing to the abandonment of the Works. They are practically as sound as when first laid.

For further particulars, apply to the BOROUGH SURVEYOR, Town Hall, BURY ST. EDMUNDS.

SULPHURIC ACID.

THE Gas Committee of the Lancaster Corporation invite TENDERS for the Supply of about 120 tons of B. O. V., made from Sulphur or Spent Oxide of Iron, suitable for the Manufacture of Sulphate of Ammonia—Strength, 146° by Twaddel's hydrometer—for a term of One year, from the 1st day of April next.

Sealed tenders, endorsed "Tender for Sulphuric Acid," to state price per ton in carboys as required, delivered on the Gas-Works Siding, Lancaster, including carriage for the return of empties, to be sent on or before the 16th prox. to Thom. Swainson, Town Clerk, Lancaster.

C. ARMITAGE, Manager.

Gas-Works, Lancaster, Jan. 24, 1889.

TO TANK CONTRACTORS.

THE Gas Committee of the Leigh Local Board invite TENDERS for the Construction of a BRICK GASHOLDER TANK, 102 feet diameter and 28 ft. 6 in. deep.

Drawings may be seen, and a copy of specification obtained, on application to the undersigned.

Sealed tenders, endorsed "Tank," and addressed to Jas. Thorp, Esq., Chairman, to be delivered at the Town Hall, Leigh, not later than Monday, the 11th of February next.

ALFRED T. FLETCHER,
Engineer, &c.

Gas-Works, Leigh, Lancs.,
Jan. 22, 1889.

TENDERS FOR GASHOLDER.

THE Directors of the Eton Gas and Coke Company invite TENDERS for the Construction and Erection of a TELESCOPIC GASHOLDER, 50 feet diameter by 16 feet deep, with Cast-Iron Tank for same, together with foundations and other work, at the Gas-Works, Eton, Bucks.

Plans, specification, and form of tender may be inspected and copied on application at the Offices of the Company, 194, High Street, Eton, between the hours of Ten a.m. and Four p.m.

Tenders to be sent in not later than Four o'clock p.m. on Monday, the 18th of February, addressed to the Chairman of the Company, and endorsed "Tender for Gasholder."

The Directors of the Company reserve to themselves the right of refusing to accept the lowest or any tender.

By order,
GEORGE HENRY LONG, Chairman.

Eton, Jan. 23, 1889.

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

TENDERS wanted for Eighty Gas- COLUMNS for Street Lamps, including Cradle and Lantern, delivered at Buckhurst Railway Station.

Tenders to be sent in, on or before the 13th inst., addressed to the CHAIRMAN, Gas-Works, Woodford ESSEX.

RETORTS AND FIRE-BRICKS.

THE Directors of the Rochester, Chat- ham, and Strood Gaslight Company invite TENDERS for the supply of about 1100 feet run of CLAY RETORTS and 130,000 FIRE-BRICKS, &c., according to specifications and forms of tender, which may be had on application at the Office, 58, High Street, Rochester, where tenders must be delivered (addressed to the Secretary, and endorsed "Tender for Fire Goods") not later than Noon of Thursday, Feb. 14 inst.

WILLIAM SYMS, Secretary.

Feb. 1, 1889.

TENDERS FOR GASHOLDER, TANK, AND FOUNDATIONS.

THE Directors of the Rochester, Chat- ham, and Strood Gaslight Company invite TENDERS for the Construction and Erection of a TELESCOPIC GASHOLDER 126 ft. by 26 ft. 3 in., with a Wrought-Iron ANNULAR TANK 132 ft. by 27 ft., and a Wrought-Iron GUIDE-FRAMING, rising 53 ft. 6 in. above the top of Tank. Also for the EXCAVATION and FOUNDATION necessary to receive such Gasholder, Tank, and Guide-Framing.

Plans can be seen, and copies of specification had, on application at the Offices of the Company, 58, High Street, Rochester.

Tenders, marked "Tender for Gasholder and Tank" or "Tender for Excavation, Piling, &c.," to be delivered at the Offices as above before Noon of Thursday, the 28th of February, 1889.

The Directors will not be bound to accept the lowest or any tender.

WILLIAM SYMS, Secretary.

Jan. 31, 1889.

RAMSGATE CORPORATION.
(GAS AND WATER DEPARTMENT.)

THE Committee desire Tenders for about 220 feet of FIRE-CLAY RETORTS 22 in. by 16 in., as also about 14,000 FIRE-BRICKS and 10 tons of CLAY.

Tenders to be sent in addressed to the Chairman of the Gas and Water Committee, not later than 10 a.m. on Tuesday, Feb. 12, 1889, endorsed "Tender for Fire-Clay Goods."

The Committee do not bind themselves to accept the lowest or any tender.

Further particulars on application to
WILLIAM A. VALON, Engineer.

TO GASHOLDER MAKERS.

THE Directors of the Airedale Gas Com- pany invite TENDERS for the Excavating, Concreting, and Construction of a WROUGHT-IRON TANK and a THREE-LIFT GASHOLDER 62 feet diameter and 20 feet deep.

Plans and specifications can be seen and copies obtained on application to the Manager at the Gas-Works.

The Directors do not bind themselves to accept the lowest or any tender.

Tenders, endorsed "Tender for Tank and Gasholder," to be forwarded to the undersigned, on or before Monday, the 11th day of February, 1889.

By order,
EDWIN THORNTON, Secretary.

Gas Office, Idle, near Bradford.
Jan. 30, 1889.

BRIDGNORTH GAS-WORKS.

TENDERS FOR SURPLUS TAR.

THE Gas Committee are prepared to receive TENDERS for the purchase of the Surplus TAR (about 100 tons) produced at these Works for One year from commencement of Contract. Also for the present stock of TAR—about 100 tons. The Tar would be delivered on rails at Bridgnorth Station, in Contractors' Tanks.

Endorsed and sealed tenders to be sent to the undersigned not later than the 11th inst.

Neither the highest nor any tender will necessarily be accepted.

By order,
J. H. COOKSEY, Town Clerk,
Secretary.

Bridgnorth, Feb. 1, 1889.

OLDBURY LOCAL BOARD OF HEALTH.
(GAS DEPARTMENT.)

OXIDE OF IRON.

THE Gas Committee of the above Board are prepared to receive TENDERS for the Supply of 60 tons of OXIDE OF IRON, for purification purposes, delivered to the Oldbury Station of the Great Western Railway, or the Canal Wharf of the Board.

Tenders to be endorsed "Oxide," and samples of Oxide must accompany same, and be received by the undersigned on or before the 16th inst.

The lowest or any tender not necessarily accepted.

By order,
CHAS. MEIKLEJOHN, Manager.

Gas-Works, Oldbury, Feb. 2, 1889.

OLDBURY LOCAL BOARD OF HEALTH.
(GAS DEPARTMENT.)

SPENT OXIDE.

THE Gas Committee of the above Board will be glad to receive TENDERS for the Purchase of about 120 tons of SPENT OXIDE.

Samples and particulars may be had on application to the undersigned, from whom any further information may be obtained.

Tenders must be endorsed "Spent Oxide," and be received by me on or before the 16th inst.

By order,
CHAS. MEIKLEJOHN, Manager.

Gas-Works, Oldbury, Feb. 2, 1889.

TO STATION METER AND GOVERNOR MAKERS.

THE Directors of the Clayton, Allerton, and Thornton Gas Company are prepared to receive TENDERS for a SQUARE STATION METER, in Cast-Iron Ornamental Case, capable of passing 40,000 cubic feet of Gas per hour. Also Two COMPENSATING GAS GOVERNORS, one 18-inch and one 15-inch, with all Bye-Pass Arrangements, Valves, &c.

Particulars to be obtained from the Company's Engineer.

All tenders to be sent in, addressed to the Chairman of the Company, and marked "Tender for Station Meter" or "Governors" as the case may be, on or before Monday, the 11th day of February, 1889.

By order,
JOHN NIVEN,
Engineer and Manager.

Gas Works, Clayton, near Bradford,
Jan. 18, 1889.

TO ENGINEERS, IRONFOUNDERS, ETC.

THE Corporation of Birkenhead are pre- pared to receive TENDERS for the Supply and Erection of Cast and Wrought Iron FITTINGS required for new RETORT BENCH at their Gas-Works.

Plans and specifications may be seen, and bills of quantities obtained (on deposit of one guinea), at the Office of the Gas Engineer, Mr. T. O. Paterson, C.E., Gas-Works, Thomas Street, between the hours of 10 a.m. and 5 p.m.

Tenders, sealed and endorsed "Retort Fittings," to be sent in to me not later than Five p.m. on Friday, the 15th inst.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
ALFRED GILL, Town Clerk.

Town Hall, Birkenhead,
Feb. 2, 1889.

BARNET DISTRICT GAS AND WATER COMPANY

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Guildhall Tavern, Gresham Street, in the City of London, on Friday, the 22nd day of February next, at Half-past Twelve o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st day of December last; to declare a Dividend; to elect Directors and an Auditor; and to transact the General Business of the Company.

The Transfer Books will be closed from the 9th to the 22nd of February, both inclusive.

By order of the Board,
ALFRED LASS, Secretary.

Offices: 30, Gracechurch Street,
London, Jan. 18, 1889.

MITCHAM AND WIMBLEDON DISTRICT GAS-LIGHT COMPANY.

INCORPORATED BY ACT OF PARLIAMENT, 1867.

NOTICE is hereby given that the Forty- FOURTH ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of this Company will be held in the Board-Room, at the Works, Mitcham, in the County of Surrey, on Tuesday, the 26th day of February, 1889, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and a Statement of the Accounts for the Half Year ended Dec. 31, 1888, to declare a Dividend, to elect Directors and Auditor in place of those retiring by rotation, and for General Business.

The Transfer Books will be closed from the 11th inst. until after the Meeting.

NOTICE IS HEREBY FURTHER GIVEN that at the close of the Ordinary Half-Yearly Meeting an EXTRAORDINARY GENERAL MEETING of the Shareholders will be held, to sanction the Creation and Issue of the NEW ORDINARY SEVEN PER CENT. SHARES of the ADDITIONAL CAPITAL of the Company, in accordance with the provisions of Clause 21 of the Company's Special Act, to decide the Terms upon which the same shall be issued, and to authorize the Directors to make such calls on the Shares as they may from time to time deem necessary for carrying out any extensions or additions that may be required to the Works, Mains, Plant, &c., of the Company.

By order,
BENJAMIN GREEN,
Secretary and Manager.

Offices and Works: Merton Lane,
Mitcham, Feb. 5, 1889.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Invention may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

Price 21s. Fcap. folio, scarlet cloth.

Plans and Description of the Extensions

AT THE

WINDSOR STREET GAS-WORKS OF THE BIRMINGHAM CORPORATION,

DESIGNED AND CARRIED OUT BY

CHARLES HUNT, M. Inst. C. E.,

Engineer of the Works.

LONDON:

WALTER KING, 11 Bolt Court, FLEET STREET, E.C.

Gas & Water Cos.' Directory, 1889.
Gas & Water Cos.' Statistics, 1889.
Water-Works " 1889.

Will Officials of Gas and Water Companies kindly fill up and forward AT ONCE the Form of Return sent them ?

C. W. HASTINGS (Editor).

Price 4s., post free.

IMPROVEMENTS IN APPARATUS

Employed in the Manufacture of Gas.

By GEORGE ANDERSON.

Third Edition, with 22 Illustrations.

REWRITTEN AND ENLARGED, WITH A CHAPTER ON THE

"Purification of Gas,"

By (the late) Mr. R. H. PATTERSON, F.S.S.

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WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

Improved Edition, on Superior Paper.

SANDELL'S GAS COMPANIES' EXPENDITURE JOURNAL.

Being a Ruled Account Book, with Printed Headings and Analyzing Guide, for Keeping (upon the easiest and most correct method) the Expenditure of a Gas Company in accordance with the provisions of the Gas-Works Clauses Act of 1871, and suitable for all Companies.

Prices :

Limp Cloth—Half Quire, 10s.; *One Quire*, 16s. *Half Bound, Cloth Sides—Two Quires*, 36s.; *Three Quires*, 44s.

TO BE HAD OF THE PROJECTOR,

EDWARD SANDELL, Chartered Accountant, No. 181, Queen Victoria Street, E.C.

OR OF

WALTER KING, "Journal of Gas Lighting," 11, Bolt Court, Fleet Street, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

IMPROVED RETORT SETTING.

W. G. WALLER & Co.,
RETORT SETTERS & CONTRACTORS,

Having had much experience in the Setting of Retorts, beg to call the attention of Gas Engineers and Managers to their Improved System of Setting Retorts and Tar-Furnaces.

Contractors for Building Shafts, Tanks, Retort Benches, and all other Buildings connected with Gas-Works.

Estimates on application.

The Poplars, Waddon, Croydon, Surrey.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

TROTTER, HAINES, & CORBETT,
BRETTELLS' ESTATE
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICK,
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

TAR AND LIQUOR PURCHASED

JOHN CLARKSON MAJOR,
(Established 1851,)
Tar Distiller and Manufacturing Chemist,
WOLVERHAMPTON.
BRANCH WORKS:—
SCULCOATS, HULL.

THE ONLY RELIABLE
DRY CENTRE-VALVE.

WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.

ALSO MADE FOR TWO OR THREE PURIFIERS.

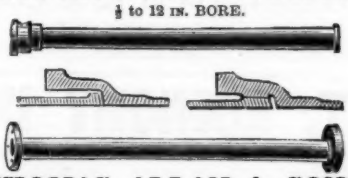
No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.

Write for Prospectus.

ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.

F. WECK, 86, NEW STREET, BIRMINGHAM.

GAS AND WATER PIPES.
½ to 12 IN. BORE.



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SPRINGBANK IRON-WORKS,
GLASGOW;
AND BON LEA FOUNDRY,
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Makers of SANITARY & RAIN PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

GAS COAL.

POPE & PEARSON, LTD.,

have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12¼ cwt. of good coke.

This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

TELESCOPIC EXTENSION LADDERS & STEPS. All sizes, many patterns, large stock for all purposes, indoor and outdoor. Admirable inventions.

HEATHMAN & CO.,
2 Endell St., & 11, High St., Bloomsbury, London, W.C.

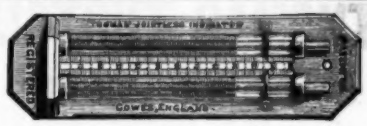
COKE BREAKERS,
FROM £14 EACH.
(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
HOLLAND STREET, SOUTHWARK, S.E.

MARQUIS OF LOTHIAN'S
NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO
MR. JOHN MORISON,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.



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They are proved to be the best ever made.

Supplied to the following Works:—

RYDE, VENTNOR, SHANKLIN, NEWPORT, EAST COWES, LYMINGTON, FAREHAM, WINCHESTER, BRIDPORT, GOSPORT, PORTSMOUTH, SOUTHAMPTON, READING, GUILDFORD, WARE, SOUTH METROPOLITAN, SALISBURY, AYLESBURY, NEWTOWN, WINSLOW, ABERGAVENNY, YARMOUTH, I.W., SANDOWN, I.W., WARE (repeat order), GUILDFORD, (repeat order), TROWBRIDGE, EASTBOURNE, HIGH WYCOMBE, WELLS, RAMSGATE, FELIXSTOWE, NEWTOWN (repeat order), CRYSTAL PALACE, UPPER SEDGLEY, BECKTON, BROADSTAIRS, NEWTOWN (repeat order for two), FAVERSHAM, SITTINGBOURNE, UXBRIDGE, PORTISHEAD, RICHMOND, CIRENCESTER, &c.

Gas-Works, Shanklin, I.W., May 7, 1888.

MR. A. THOMAS, DEAR SIR,—I consider the new Pressure-Gauge a decided improvement upon the old style, especially for crude gas. I shall replace all broken gauges upon the works with your patent.

Yours faithfully, FRANK C. TAYLOR.

Cosham, May 15, 1888.

MR. A. THOMAS, Cowes.

DEAR SIR,—I am perfectly satisfied with your new Pressure-Gauge; and for simplicity, it excels any other that has come under my observation. It is perfectly accurate in registering when compared with the ordinary gauge; being jointless, is cleaned with the greatest ease and least possible risk of breakage.

Yours truly, JOHN HENRY LYON.

Gas Offices, Guildford, Sept. 26, 1888.

MR. THOMAS, SIR,—I have pleasure in testifying as to the excellence of your jointless Pressure-Gauges. I certainly consider them a great improvement on the old form of gauge; and the ready and easy manner in which the gauges can be taken to pieces for cleaning, coupled with no risk at all of breaking, should secure their adoption whenever Gas Pressure-Guages are required. We sent another order from Guildford yesterday. I remain, truly yours, W. LONGWORTH.

Salisbury, Oct. 1, 1888.

MR. A. THOMAS,

DEAR SIR,—I have used the set of double 18-inch Gauges on your principle at Salisbury for about three weeks, and consider them in every way an improvement on the U-pattern gauge. They are simpler, cheaper, more easy to clean and keep in order, more portable, and less liable to fracture.

Yours faithfully, N. H. HUMPHRYS.

Gas-Works, Fareham, Nov. 15, 1888.

MR. A. THOMAS, Cowes.

DEAR SIR,—Your Gauges have exceeded my expectation. I have had them in use for several months; and I consider them a great improvement on the old gauge.

Yours faithfully, J. GRIFFIN.

For further particulars, apply to—

A. THOMAS, GAS-WORKS, COWES.

ARMSTRONG'S
PATENT
CANDLE SAFETY LAMPS.
Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

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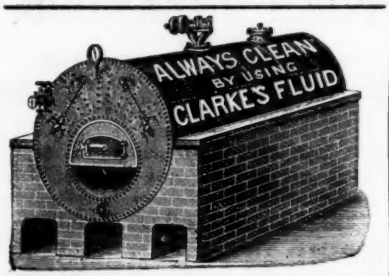

A 10-H.P. BOILER
KEPT PERFECTLY CLEAN FOR
ONE SHILLING PER WEEK
And much smaller Coal Bills. Softens the Hardest Water, and keeps Gauge-Glasses quite clear.

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THOMAS TURTON AND SONS, LIMITED,
SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNER RATCHET BRACES, LIFTING-JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
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SILICA
OR
GANISTER BRICKS
OF VARIOUS SIZES,
GROUND GANISTER, FIRE-BRICKS, &c.
SUPPLIED FROM
PEASE'S WEST WORKS, CROOK, BY
PEASE & PARTNERS, Limited,
DARLINGTON.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE,
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To effect a great saving in
GAS-FURNACES use our
Special Derbyshire GANNISTER BRICKS.
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PUMPS
FOR
STEAM AND OTHER POWER.

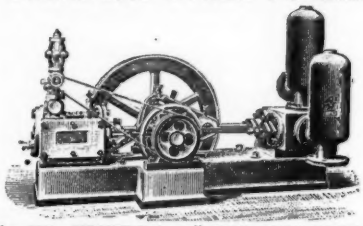
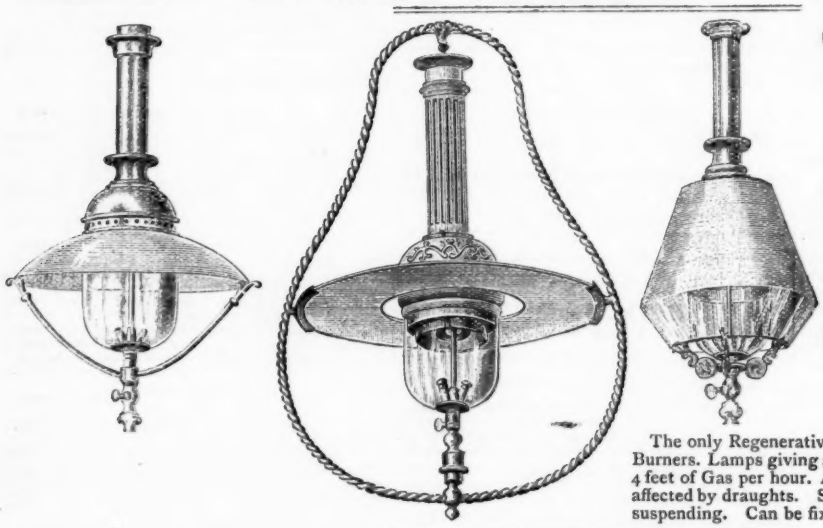


Fig. 685.—EVANS' Patent "RELIABLE" REVERSIBLE TAR and LIQUOR PUMP. In use everywhere. The Best in the World.

Fig. 600.—EVANS' Patent "CORNISH" DIRECT-ACTING STEAM-PUMP. FOR EVERY PURPOSE.

SEE NEW CATALOGUE.

60 PER CENT. ECONOMY IN GAS LIGHTING.



THE SCHÜLKE REGENERATIVE LAMP
FOR
DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the common Flat-Flame Burners. Lamps giving a Light of 20-Candle Power consume less than 4 feet of Gas per hour. A pure, white, and perfectly steady light, not affected by draughts. Suitable for any existing fittings—brackets or suspending. Can be fixed in a few minutes.

MAY BE SEEN AT THE OFFICES OF THE
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WHERE PRICE LISTS AND FULL PARTICULARS MAY BE OBTAINED.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

MIRFIELD, NORMANTON.

PATENT

ARTIFICIAL PEROXIDE OF IRON,

LUX MASS,

IN USE AT

BERLIN, VIENNA,
PARIS, COPENHAGEN, STOCKHOLM,
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NORTH DEAN CHEMICAL WORKS,

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MANUFACTURER OF SULPHURIC ACID

OF EXTRA QUALITY FOR MAKING

WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

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FOR GAS AND WATER.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,

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THE

LANEMARK COAL Co., LTD.,

Now offer their superior

GAS COALS

LANEMARK CANNEL.

Yield of Gas per ton . . 10,880 cub. ft.
Illuminating Power . . 29·21 candles.
Coke per ton . . . . 1266·96 lbs.

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Yield of Gas per ton . . 10,734 cub. ft.
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Coke per ton . . . . . 1320 lbs.

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HISLOP'S PATENT

GAS PRODUCER AND REGENERATIVE SYSTEM OF HEATING RETORTS.

The Patentee's Settings on the Shallow Sunk Chamber Plan,

AND OF FROM

One to Eight Retorts per Oven,

Are at once the most inexpensive and efficacious that can possibly be devised, and are giving absolute satisfaction where in use. By a new and improved means, the Producers of all Settings are now filled directly from the Retorts.

Particulars from the Patentee's Agent for England, J. E. FISHER, Esq., Stourbridge, or from the Patentee,

G. R. HISLOP, F.C.S., &c., Engineer, GAS-WORKS, PAISLEY, N.B.

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Invite attention to the following Specialities:—

PATENT STREET LAMPS,

NO PUTTY OR OTHER MATERIALS ARE REQUIRED TO SECURE THE GLASS. PRICE 9s. 9d. EACH NET.

D. Hulett's Improved Service Cleanser, for the removal of Naphthalene and other obstructions in Service-Pipes. Price 70s. net.

IMPROVED HIGH-POWER LANTERNS; PRICES ON APPLICATION.

Patentees of Improved Wet and Dry Gas-Meters.

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ATLAS STEEL AND IRON WORKS, SHEFFIELD,

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This Coal yields 12,600 feet of 19-candle gas per ton.

Weight of illuminating matter in pounds of sperm, 820·80. Very free from impurities.

JOSEPH CLIFF AND SONS,

THE ORIGINAL (ESTABLISHED 1795).

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NEAR LEEDS.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

AT THE PARIS EXHIBITION, 1878,

THREE MEDALS AND HONOURABLE MENTION

WERE AWARDED TO

JOSEPH CLIFF & SONS,

For their Various Exhibits, amongst which is a

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Being the Highest Honour given for this Class.

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GAS COAL.

BEST
REAL OLD SILKSTONE GAS COAL.
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[ESTABLISHED OVER 50 YEARS.]

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ALSO

Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.

ALSO ALL WROUGHT-IRON WORK.

THE LARGEST MAKERS IN WALES.

ALDER AND MACKAY,

MANUFACTURERS OF

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.

ORIGINAL MANUFACTURERS OF DRY METERS IN CAST-IRON CASES.

STATION METERS, EXPERIMENTAL METERS, PHOTOMETERS, & PRESSURE-GAUGES, &c.

Results of Tests of Dry Gas-Meters (Section III.) of the Glasgow Philosophical Society's Gas Exhibition, as per London "Gas Journal," May 10, 1881.

	ALDER & MACKAY.	W. & B. Cowan.	G. Glover & Co.	James Keith.	D. B. Peebles & Co.
Total of Fast Tests . .	47·2 ...	6·9 ...	33·6 ...	62·3 ...	53·7
Total of Slow Tests . .	25·3 ...	117·4 ...	43·1 ...	31·4 ...	38·5
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Descriptive Circulars, Price Lists, and Full Particulars forwarded on application.

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HIGHEST AWARDS given to our WET and DRY METERS, at Exhibitions held at Glasgow, Calcutta, and Edinburgh.

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First Order of Merit and Medal.

MANUFACTURERS OF
WELDED IRON TUBES AND FITTINGS
FOR GAS, STEAM, WATER, &c.
LAP-WELDED TUBES
FOR LOCOMOTIVE, MARINE, AND STATIONARY BOILERS, AND OTHER PURPOSES.
HYDRAULIC AND HOT-WATER TUBES.
COILS OF ALL SIZES AND SHAPES.
Stocks, Taps, Dies, Taper Telegraph Poles, &c., &c.

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THE "NUGENT" RECUPERATIVE RETORT SETTINGS AND FURNACES.

"ROBUS" IMPROVED RETORT SETTINGS, WITH COKE, TAR, AND BREEZE FURNACES.

The above Settings and Furnaces are proving eminently satisfactory.

Every Particular, with Estimates, forwarded upon Application to

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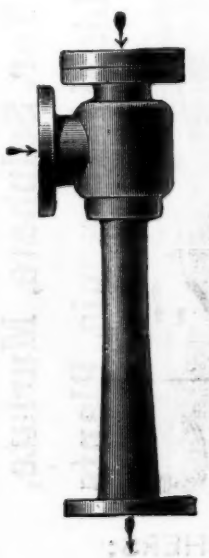
MELDRUM BROTHERS

STEAM-JET ENGINEERS,

26, Half Street, MANCHESTER,

Telegrams: "MELDRUM MANCHESTER."

MAKERS OF



Gas Exhausters with Automatic Governor working on Steam Spindle; entirely self-acting.

Revivifying Blowers and Exhausters, for continuous or intermittent use.

Compressors to 10 lbs. per square inch and upwards; for Agitating, Mixing, Oxidizing, Elevating, &c.

Ejectors for vacuum up to 26 inches mercury.

Ventilators.

Furnace Blowers for burning coke refuse and other small fuel, for Gas Producers, Re-heating Furnaces, Plus Pressure Furnaces in Chemical Works, &c., &c.

Blowers for testing with air Gasholders, Station Meters, &c.

Elevators for Acids, Gas Liquor, Water, &c.

Boiling Jets for heating liquids with Live or Exhaust Steam.

Apparatus for Acid and Corrosive Vapours and Liquids.

Most of the Appliances named may be seen in operation at the above address, by appointment.

WEST'S GAS IMPROVEMENT CO., LIMITED,

Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER **140** MACHINES AT WORK.

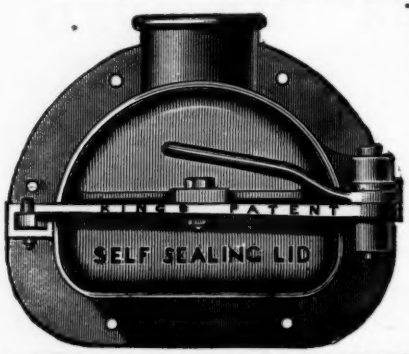
ADVANTAGES ATTENDING ITS USE ARE:—

INCREASED VOLUME of GAS per TON and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE** per Ton of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by Wire Rope, Steam, or Compressed Air.—The power machines are applicable to circular, oval, or Ω-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made; they are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.



Sole Makers of **CIRCULAR, OVAL,** or Ω-shaped **MOUTHPIECES,** with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and as the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

N.B.—The whole of these Fittings are made of Wrought Iron.

Estimates and further particulars forwarded upon application for Mouthpieces complete, or for Lids and Fastenings separately.

MAKERS OF THOMAS AND SOMERVILLE'S COKE-BREAKING MACHINE.

SOLE MAKERS OF WHITE'S PATENT AUTOMATIC GAS-VALVE.

Mr. JOHN WEST, M. Inst. C.E., Managing Director.

ILLUSTRATED CATALOGUE SENT UPON APPLICATION.

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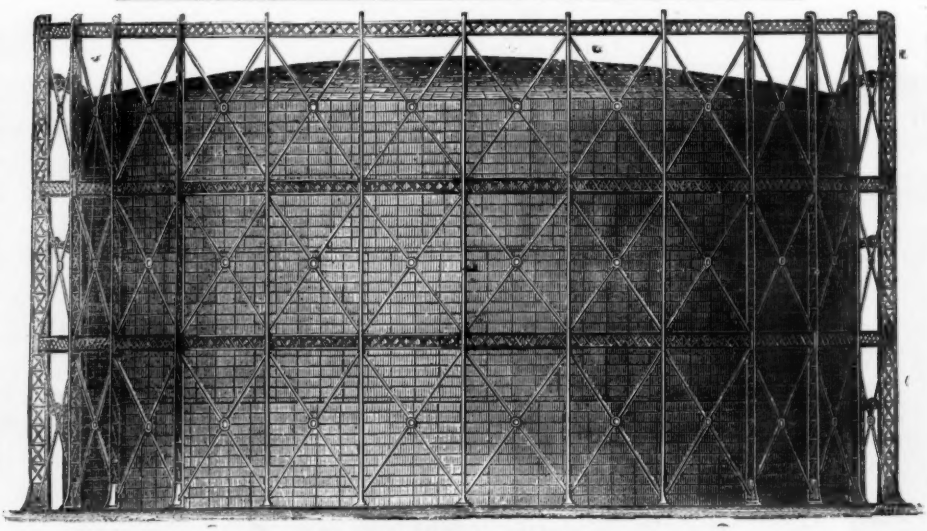
WHITESTONE IRON-WORKS, HUDDERSFIELD,

And 80, CANNON STREET, LONDON, E.C.

GASHOLDERS OF Improved Construction.



Tar, Sulphate, Muriate, AND Liquid Ammonia Plants.

MAKERS OF

IMPROVED CONDENSERS, SCRUBBERS, AND WASHERS;

PURIFIERS with PLANED JOINTS; CENTRE-VALVES TO WORK ALL FOUR PURIFIERS; EXHAUSTERS,

AND ALL APPARATUS and FITTINGS used in GAS MANUFACTURE.

HUNT'S PATENT SUN-BURNER VENTILATING CEILING LIGHT.

This new Ventilating Ceiling-Light has been designed to meet a long-felt requirement—namely, greater economy and effectiveness, combined with the convenience and adaptability of the ordinary Sun-Burner. The combination of hexagonal reflectors by which it is formed, affords a very large reflecting surface, and their arrangement admits of the employment in a vertical position of the best known types of flat-flame burners; by which means an exceedingly brilliant, steady, and satisfactory lighting is secured. It can be supplied of any desired power, from a consumption of 50 or 60 cubic feet per hour to one of 1200 cubic feet per hour, and is suitable for lighting large Offices, Banks, Churches, Chapels, Theatres, and other Public Buildings. It is reasonable in its first cost, and economical in gas consumption in comparison with the light afforded.

These Sun-Burners are now fixed in the following towns:—

AYLESBURY	2
ASTON MANOR	2
BIRMINGHAM	13
BRECON	4
COVENTRY	1
HANLEY	1
LEEK	2
NEWCASTLE-ON-TYNE	3
NEWCASTLE-UNDER-LYME	4
OLDBURY	2
REDDITCH	1
STOURBRIDGE	9
SOUTHPORT	5
ST. ALBANS	2
WOLVERHAMPTON ..	6
WEDNESBURY	2
YOKOHAMA	1

Numerous References and Testimonials upon application with Prices.

ORDINARY METER.

Wet & Dry Gas-Meters.

HUNT'S PATENT
COMPENSATING GAS-METER.

Station Meters & Governors.

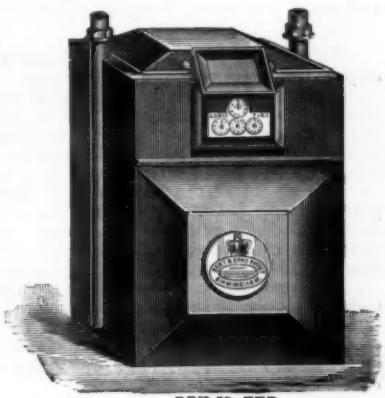
OFFICIAL TEST-METERS.

LAMP METERS & GOVERNORS.

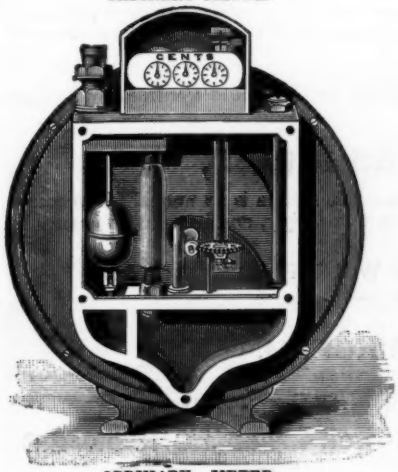
TEST HOLDERS.

PRESSURE-GAUGES.

LAMPS AND EVERY REQUISITE FOR PUBLIC LIGHTING.



DRY M TER.

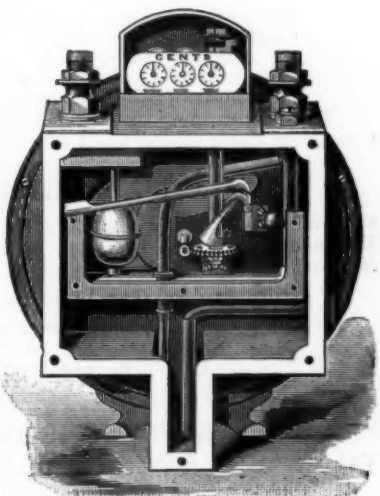


ORDINARY METER.

BRADBEAR'S IMPROVED PATENT GAS-ENGINE GOVERNOR,

Which effectually prevents Oscillation of Gas in Mains supplying Gas-Engines.

PRICES & TESTIMONIALS ON APPLICATION.



HUNT'S COMPENSATOR.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,

Telegraphic Address: "GASMETERS, BIRMINGHAM." ESTABLISHED 1830.

HOW TO SECURE THOUSANDS OF SMALL CONSUMERS OF GAS ALL OVER THE WORLD.

In these days there is a desire to save labour in every possible form, and the application of Automatic Machinery to all kinds of purposes proceeds with leaps and bounds.

The extension of Gas supply and the requirements of Small Consumers have had their effect upon the Inventors of Automatic Machinery.

Brownhill's "Prepayment Gas-Meter"

Is a ready means for the Small Consumer to pay for his Gas in advance, and in small quantities, either daily, weekly, monthly, or at any given period in which a certain quantity will be required.

The result is a great benefit to the consumer, as he has no calls, dunning him for the "Money for the Gas," from collectors; if he has used his ONE PENNY'S WORTH, he can always drop in another PENNY without asking anyone. Has no fear of having his "Gas Cut Off," pays as much as he likes, consumes what he pleases, and is in every sense his own master, so far as Gas supply is concerned.

To Gas Companies and Gas Committees

Brownhill's "Prepayment Gas-Meter"

Offers enormous facilities for the extension of Gas supply, especially to Small Consumers. Statistics show that there are 50 per cent. non-consumers situated along the lines of Gas-Mains in districts where there is a good supply at the door. No expensive system of collection has to be adopted; and the cash is paid always before the Gas is consumed. Gas suppliers must look to the consumers of small quantities of Gas to increase the consumption of Gas. If

Brownhill's "Prepayment Gas-Meter"

be adopted, a blow will be directed at the dangerous use of mineral oils, by which 300 lives are annually lost within the United Kingdom. The artisan class will have a safe light always at their command; and they will find Gas cheaper, cleaner, and more wholesome than any oil in the market.

DESCRIPTION OF METER.

This Patent is a small attachment which can be applied to all Meters, new or old, and which will deliver gas in quantities as paid for by pence deposited in a box.

The attachment is made so that only one penny at a time can be put into the box. Although 143 pence can be put in consecutively, each penny will pay for sufficient gas for one burner, to last between six and eight hours. When a gas consumer pays a penny or any number of pence into the meter, the action of the meter will be at once operated upon to a proportionate extent. A dial will also at all times indicate the amount paid for, and not used. The light will diminish a quarter of an hour before the gas paid for is actually used up; thus giving notice that a further payment is required.

The object of the "Prepayment Gas-Meter" is to place the consumption of gas as easily within reach of the mass of the population as petroleum, candles, &c., so that it may be purchased even a pennyworth at a time, and without any initial outlay or trouble, such as deposit, reference, or guarantee, now required by the Gas Companies. The increased light and many conveniences of gas would thus be obtained economically; and the great danger from petroleum and benzoline, and the disagreeable smell from cheap lamps and oil, obviated.

An important consideration, which cannot be overlooked, is the duty of Gas Companies and Corporations, who have a first-class monopoly, to supply the working classes with gas, without the burden and restrictions which now exist.

It is anticipated that there will be a great demand for these Meters in houses of all classes, especially in those with rents ranging from £13 to £50 per annum, as it will be a great advantage to these occupiers to pay for their gas only as it is required, as for other household goods. **Occupiers will thus be able to control their weekly expenditure of Gas, and to check leakages and waste.**

The Meter will be in demand for—

(1) Sub-tenancies in large manufacturing premises where each sub-tenant has to pay for gas. This is a large class, both in London and the provinces.
(2) Stable and yard purposes, connected with hotels and other places of business.
(3) Householders generally, as, by using this attachment, caretakers or servants will only require pence to obtain their gas, and cannot use it beyond the amount paid for; and thus when houses are left in charge of caretakers or servants the consumption of gas would be controlled.
(4) Rooms or premises let for entertainments by day or week.

Messrs. Sommerville & Co., of 17, Temple Street, Birmingham, are now prepared to enter into Contracts with Gas Companies, Corporations, Local Boards, and Others for the supply of

Brownhill's "Prepayment Gas-Meter,"

and with Gas-Meter Manufacturers, for the right to adopt the prepayment principle. The system is an unqualified success. The meters have been examined by hundreds of Engineers and others interested in Gas supply, and have been favourably reviewed in the

"Journal of Gas Lighting," "Gas World," "Gas and Water Review," &c., &c.

PATENTEE:
R. W. BROWNHILL, Aston, near BIRMINGHAM.
MANUFACTURERS:
W. PARKINSON & Co., Cottage Lane, City Road, LONDON.
THOMAS GLOVER & Co., 214 to 222, St. John St., Clerkenwell Green, LONDON, E.C.

FOR FURTHER PARTICULARS AND TERMS APPLY TO

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THE

"PERFECT" CONDENSER

(MORRIS & CUTLER'S PATENT).

The most successful Condensing Apparatus in the Market.

OVER 50 IN OPERATION.

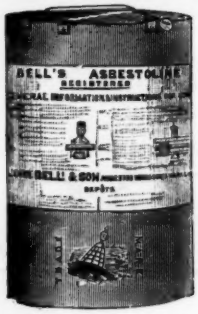
SUITABLE EITHER FOR LARGE OR SMALL WORKS.

SAMUEL CUTLER & SONS,

CONTRACTING GAS ENGINEERS,

Millwall, London.

BELL'S ASBESTOLINE.

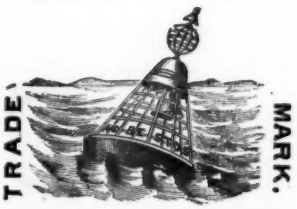


All kegs are labelled as above.

REGISTERED.

ADVANTAGES OF ASBESTOLINE.

ASBESTOLINE is the most efficient Lubricant for all bearings.
ASBESTOLINE is the cheapest Lubricant.
ASBESTOLINE saves from 50 to 90 per cent. of the Cost of Oil.
ASBESTOLINE is the Cheapest Lubricant.
ASBESTOLINE is favoured by Insurance Companies.
ASBESTOLINE is the most Inodorous Lubricant.
ASBESTOLINE is the safest Lubricant from Ignition.
ASBESTOLINE has beaten all other Lubricants in trials.
ASBESTOLINE is applicable in and out doors in every Climate.
ASBESTOLINE requires no special application.



BELL'S ASBESTOS.

CONSISTENCY OF ASBESTOLINE.

ASBESTOLINE, to meet all circumstances, is made in four degrees of consistency—A, B, C, and CC.

ASBESTOLINE, A, is specially adapted to ordinary Land Engines and Machinery, in and out door, in this country.

ASBESTOLINE, B, a little more solid, is for use on Steamships in temperate climates, also on land when it is desirable to have Lubricant stiffer than A.

ASBESTOLINE, C, is for use in tropical climates, both ashore and afloat. It is also invaluable in works in this country when the temperature is high.

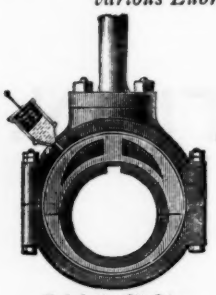
ASBESTOLINE, CC, is designed for use on Calenders, Paper-Machines, &c., where the bearings are heated by steam passing through, and sometimes is advantageously used instead of C.

The reputation of Asbestoline as a Lubricant of the highest efficiency in every kind of Machinery is established; and it has never been equalled by any other Lubricant in the numerous cases of special difficulty in which the best oils are ineffectual. It is used with marked success in Steel and Iron Works, Collieries, Cotton and Wool Mills, and other Textile Manufactories. In Corn-Mills it has proved invaluable on the roller and other modern machines. In Saw-Mills, on machines going up to 5000 revolutions per minute, its work has never been approached by any other Lubricant. On Electric Lighting Machinery, and in Steamships of all sizes throughout the world, the success of Asbestoline is unequalled. Many engines and machines of all descriptions give trouble, and show bad results both in working and wear, when the system of lubrication has not received due consideration. Engineering firms of the highest standing have given to it their powerful testimony and support.

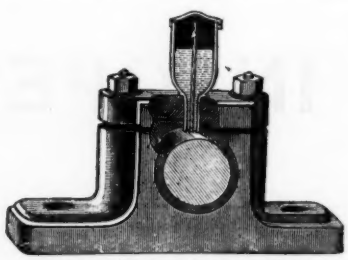
Supplied in Kegs, 28, 56, or 112 lb. Price, 2/3 per lb. Kegs Free. Special Terms for Large Quantities.

IMPORTANT TO EXPORT MERCHANTS.—*One pound of "Asbestoline" equals 2 gallons of Oil weighing 18lbs.; consequently the saving in freight is very considerable. Liberal Terms are conceded to Export Merchants.*

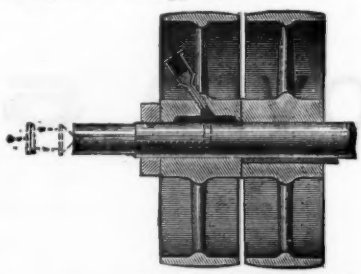
Below will be found illustrations of the mode of fixing Lubricators for Asbestoline to bearings. Full particulars of the various Lubricators supplied for Asbestoline, and the manner of fitting, in catalogue free on application.



Lubricator fitted to Eccentric of Vertical Engine



Showing Section of Lubricator fitted to ordinary Bearings.



Lubricator in different position for Loose Pulleys.

THE ATTENTION OF

ENGINEERS, AND ALL USERS OF STEAM POWER AND MACHINERY,

IS SPECIALLY INVITED TO THE FOLLOWING REPORT.

Owing to the number of Greases now offered, samples of BELL'S ASBESTOLINE were submitted to Otto Hehner, Esq., for analysis, and the subjoined Report fully proves BELL'S ASBESTOLINE to be the safest as well as the best Lubricant for all purposes:—

The Laboratory, 11, *Billiter Square, E.C., London, May* 3, 1888.

I have subjected a sample of Bell's Asbestoline taken from the stores of Messrs. J. Bell and Son, in Southwark Street, to a number of tests, in order to ascertain whether its use in Mills or Factories might contribute to the danger from Fire.

I found that Asbestoline **ignites only with the greatest difficulty** when brought into contact with flame; that wood and other combustible material soaked in Asbestoline burns, if anything, with greater difficulty than by itself; that its **flashing point** is so high that it **lies beyond the range of Mercurial Thermometers**; and that consequently no friction obtainable in the ordinary run of machinery is capable of developing inflammable vapours from it.

Bell's Asbestoline is **as absolutely safe a Lubricant as can be desired or obtainable.** In the case of fire breaking out from any cause, it does not assist the conflagration; and it is **quite incapable of leading to spontaneous combustion,** either by itself or in contact with inflammable material.

From the physical nature of Asbestoline its use is of necessity perfectly clean and free from waste.

(Signed) OTTO HEHNER, Public Analyst.

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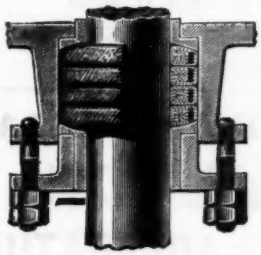

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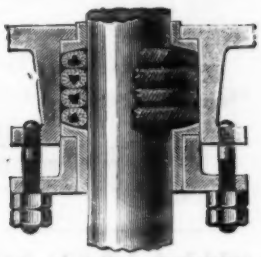

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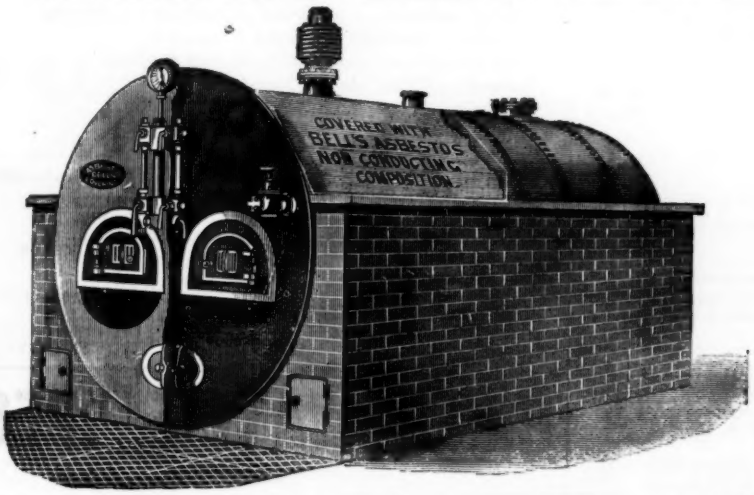

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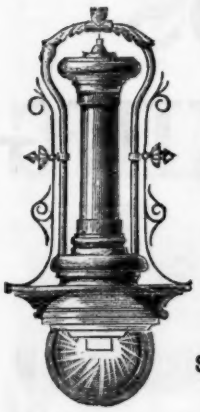

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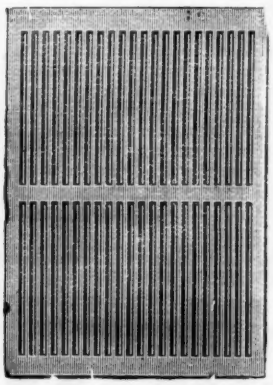

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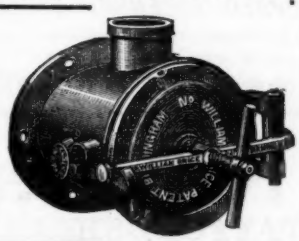

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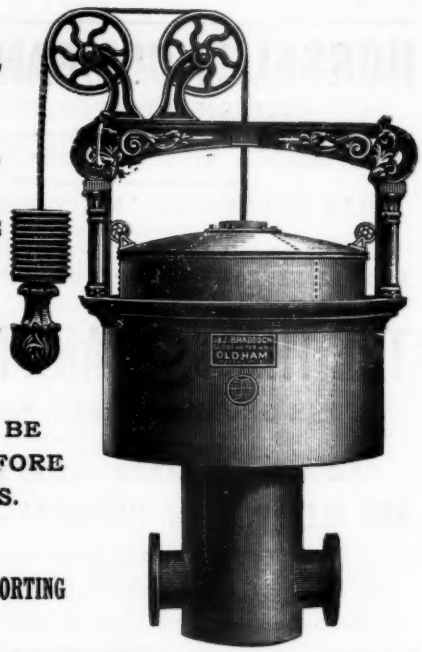

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